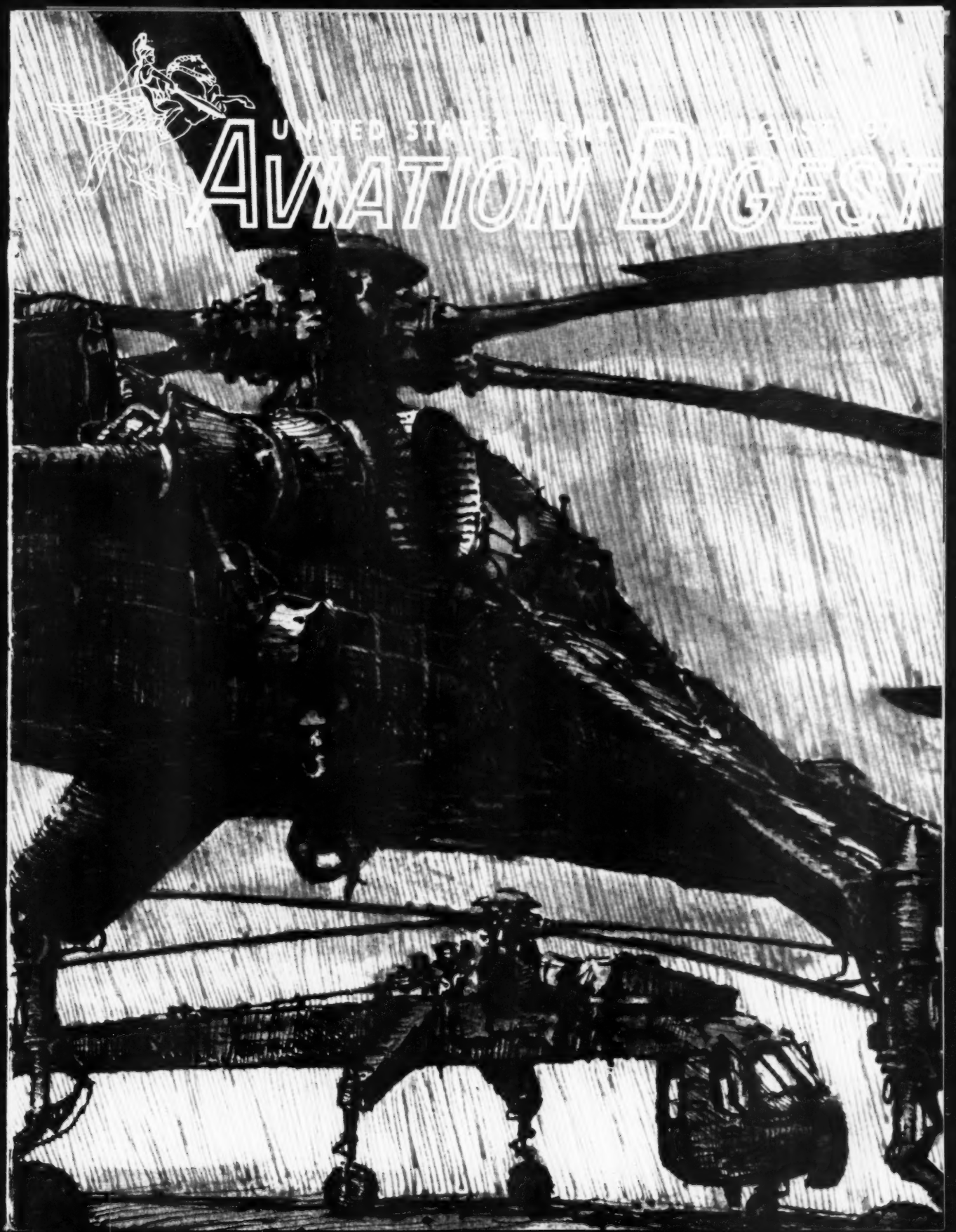
UNITED STATES ARMY
AVIATION DIGEST

UNITED STATES ARMY AVIATION DIGEST

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ABOUT THE COVER

The DIGEST would like to thank CW2 Chester Jezierski for this month's outside cover of the CH-54 "Flying Crane"

The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine, and other related data.

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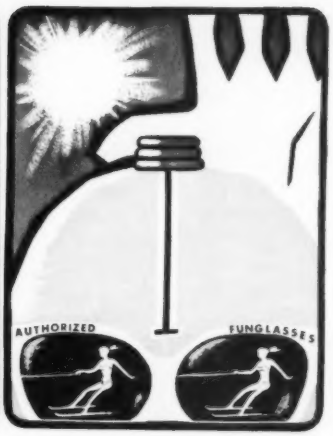
VIEWS FROM READERS



Sir:

I have just read the very fine article "The Army Cheyenne—Designed To Survive" in the May 1971 AVIATION DIGEST. My first thought was, "How does the air crewman survive after his Cheyenne is shot full of holes, on fire or out of control?" Active and passive survivability (defense) measures and features are very desirable, but combat helicopters still get shot down.

Over 20 years of escape systems design and operational background are available to the services for installation of crew escape systems in helicopters. As of this date, not one of the services has provided the operational air crewman with a means of escape. Current escape systems are successful in saving the crewman in about 85 percent of all ejection cases. Recent studies of helicopter accident records for Army, Navy and Marines indicated that over 45 percent of the fatalities incurred in the last 10 years could have been prevented by use of an inflight escape system. The feasibility of safe recovery of the crew/passenger cabin of helicopters was demonstrated at the U. S. Naval Aerospace Recovery Facility in 1965. Recently, a Navy development team demonstrated the recovery of the crewman from the AH-1 Cobra helicopter.

The AH-1 is operated by both the Army and Marines. This would be an excellent opportunity for both services to generate an "operational requirement" and conduct a bi-service development program—it's long overdue.

Gene R. Drew
U. S. Naval Aerospace
Recovery Facility
El Centro, Calif. 92243

• When the qualitative materiel requirement (QMR) for the Cheyenne was established, a requirement for a crew escape system was not incorporated due to the technical risk involved. This risk still exists; however, such a system is a continuing subject of research and development. Several systems have been considered, but none have provided a high enough degree of survivability or reliability. Also see story on page 52 of this issue. An additional story on escape systems concepts will appear next month.

Sir:

The lyrics to the nostalgic talkin' blues song "Whistling Willie" submitted by Captain David Goodwin in the April edition of AVIATION DIGEST did indeed elicit memories of the venerable and practically indestructible (?) 0-1 Bird Dog. I flew one for the 219th Headhunters, commanded then by none other than Major Arlie Deaton from north Alabama. Old indestructible himself!

On Tuesday 27 April 1971 at 1030 hours, while recovering from a simulated forced landing, it finally dawned on me that for the members of Flight 6, 0-1 Branch (of which I was a member), instructing in the Bird Dog had just ended. No longer would we have the pleasure of attempting to assist in controlling a wildly careening airplane down Skelly's centerline; or casually disengage ourselves from the cramped back seat, sending our students off to solo this tail dragger; or be amused by the student's expression of abject terror as we rolled over the top into a spin from a steep turn.

The checkride this Tuesday morning was completed and it was time to turn east to the Bird Dog IP, shoot the approach to Cairns sod and shut this airplane down for good. I took the controls on climbout from that simulated forced landing, advised the student that he had passed the checkride (an audible sigh of relief whistled over the intercom) and headed home.

Perhaps I should have allowed him to continue to fly; my mind was at least a million miles away, remembering the good times and the bad times my wingman, Phil Phillips, and I shared while up at CCC (FOB 2) in Kontum . . . the guys flying for the 170th AHC or the 361st escort, who worked with us, and the Covey Fac's or the SPADS out of Da Nang . . . some character called Dizzy standing in the only erect building at Dak Seang directing air support around the camp's perimeter . . . the VC who surrendered standing knee-deep in a rice paddy to my Bird Dog and I and the hassle it was to get a Huey to come pick him up . . . the Headhunters who are not coming home—Weisner, Aiken, Ridgeway, Pisecreta. . . .

There are, I suppose, a multitude of memories for each guy who has ever flown her. And for each of us a feeling of both pride and sadness together that we were the last ones to trust her implicitly; because the curtain has come down on the Bird Dog. She has played her last role and the show is over.

CPT Frank Doherty
Dept of Standards and
Instructor Training
U. S. Army Aviation School
Ft. Rucker, Ala. 36360

• Rocking Chair Blues—time moves on.

Continued on page 27

You Are Up On That Pedestal

Major General Ellis W. Williamson

YOU WHO ARE in Army aviation are on a pedestal. Whatever your assignment you are something special and apart and are constantly under observation.

While on that pedestal you must constantly be aware of your position and be the type of man that is expected. You must make sure you are one step above the best soldiers in the world.

Every man who is worth his salt must have a standard. He must have a stake in the ground around which he can work and say, "If I get beyond this threshold I'm going to stop, open my eyes and analyze what's going on before I venture too far from the things I value most."

In America today many people are undergoing this self-analysis, yet it seems too many of us have jumped over the abyss before we found where we were going. I fear that too many of our civil disturbances are caused by people who know that they are disturbed, but don't know why or have the foggiest idea where they are headed.

So I would like to offer you something I think is worthwhile—a thought an Army aviator can use to maintain the proper balance in these troubled times. It's what I call my "three-legged stool." A stool with only two legs won't stand up, and a stool that has more than three legs has a tendency to wobble.

However, a stool with three legs about the right length and strength will stand solid. A man likewise must have three elements that will see him through any trial, tribulation or challenge that comes his direction. These three legs I call motivation, morality and maturity.

History is full of people who had one or two of these characteristics, but fell short because the third was lacking. Just think of the Castros, Hitlers, and Mussolinis who had as much motivation as any man could want, but were disastrously short on the other qualities.

You must have motivation which is an internal, self-starting ability to move, to get things done that have to be done. Motivation is essential.

But when you start moving you need the second leg of the stool to keep going in the *right* direction. This leg I call morality, but what you call it is not important. What is important is that you need it, for without it Hitler and Mussolini caused untold damage to the world.

From morality comes the last element called maturity which is the "know-how" to solve problems in a normal, socially accepted way. We cannot run over our friends and destroy other values while we work toward only a portion of our objectives. Without maturity you will fall like a two-legged stool.

Lack of maturity is the key to many of the ills of our country today. People say, "This we believe in: anti-pollution, anti-Vietnam, anti-you name it." We have the motivation, we have the sense of direction, but many of us don't know how to go about solving the problems viably.

Under any circumstances maturity permits you to do the best you can. Rather than "passing the buck to George" the mature individual shoulders his responsibilities to humanity and does his best.

So in your present position you are up on that pedestal. You are sitting right up there where everyone can see you and the wings you proudly wear. You need motivation, morality and maturity if you are to succeed. Look at yourself to see if you have the elements that keep your stool in balance and if you are on a firm, sound foundation you can accept any challenge that comes at you.

Look inward to be sure you are right with yourself and that you are living up to your responsibilities and you can be sure that you are "Above The Best."

THE THREE-LEGGED STOOL

UNWANTED

TOOLS

Alias: FOD, Widow-maker
Description: May be disguised as a hammer, wrench, pliers, or you name it
Identifiable markings: Fingerprints (seldom used)
Last known location: Somewhere out of sight, out of mind within aircraft frame
Wanted for: Numerous accidents, near accidents, property damage, murder and other horrendous crimes too horrible to mention

Captain Larry J. Marty

I FINISHED MY preflight and strapped myself in the 0-1, a new G model. As usual nothing was found wrong while checking the ship over for seldom did we have unscheduled maintenance on her.

I performed the runup and took off late in the morning. The air was still smooth but already it was getting hot, so I climbed up to 4,000 feet where I could enjoy my flight. My trip to Can Tho in the Republic of Vietnam was actually enjoyable, especially, since I was heading for my company headquarters to begin processing out to return home.

My processing took about an hour, so around noon I was ready to return to Bac Lieu.

TOOLS

After a quick preflight and a call to the tower I was airborne. I climbed to 4,000 feet again where it had gotten warmer but still was comfortable.

The air was starting to get a little rough and the cumulus clouds were forming. The tops were at my altitude so the trip was a zigzaggy affair, dodging cloud puffs.

I was nearing home base and not any too soon for the clouds had almost built up to an overcast with only a few holes left. About 5 miles north of my home station I decided to let down through a large hole in the clouds. I felt like practicing a couple of maneuvers before ending my flight, so I rolled the 0-1 into a steep left turn for a couple of 360-degree steep turns.

While going around I let the air speed bleed off and practiced a couple of steep turn stalls, recovering in the turn and allowing the airplane to continue in the tight turn.

At the end of the second turn I rolled hard to the right and reduced the power to start descending in steep right spiral. Just as I applied hard right pressure on the stick I felt something through the controls. As I neutralized the aileron control I had a strange feeling of *something's wrong*.

The altimeter was unwinding fast and I had lost around 400 feet when something told me to level off at that altitude. I started to recover from the spiral but when I applied left pressure to the stick it wouldn't move. I got a knot in my stomach as panic set in.

The next few seconds seemed like a lifetime. All efforts to apply left aileron control failed. I was in a very tight spiral and with the stick stuck to the right of center the spiral continued to get tighter. Pulling the stick back only tightened it further. Full left rudder would have pulled the nose up, but due to panic I did not think of it. All I could think of was getting the ailerons neutralized.

A lot of things went through my mind those few seconds. The biggest was, "What a heck of a way to go with only 5 days left incountry—and because of a mechanical failure at that."

The aircraft was now in an extremely tight spiral and dropping out of the sky like a rock. I switched the UHF radio to the emergency channel to put out a Mayday call. At least I could report that my controls were stuck.

I gave the stick a frantic jerk in an effort to free the ailerons;

TOOLS

nothing again! Two more times and suddenly the ailerons broke free.

I neutralized the ailerons and recovered with rudder only, leveling off around 1,500 feet. In those few seconds which seemed like eternity I lost 2,500 feet of altitude. I believe the plane would have spiraled into the ground had the controls not broken free.

I made a quick call to the Bac Lieu tower explaining my situation and requested an immediate landing. The tower operator, listening to my panic stricken voice, advised me that he would clear the field of any other aircraft. The only other aircraft in the area were a couple of choppers refueling, and they took off immediately and orbited south of the field. That way if I lost control of the 0-1 on landing I would have the runway to myself.

After the runway was clear I started my approach using no ailerons for fear they would jam again. My landing was uneventful and I was able to use all flight controls during the roundout without any problems.

I taxied up to the refueling truck and shut down the engine. The crew chief, looking at my white face, knew that something was wrong.

After refueling the plane the crew chief parked it in the revetment and started to check it over. An inspection of the right wing revealed a bucking bar sitting inside the wing next to the bellcrank assembly. This tool had been used for some sheet metal work which was done on the wing during the last PE. The bucking bar had ridden in the wing for 97 hours on many different types of missions.

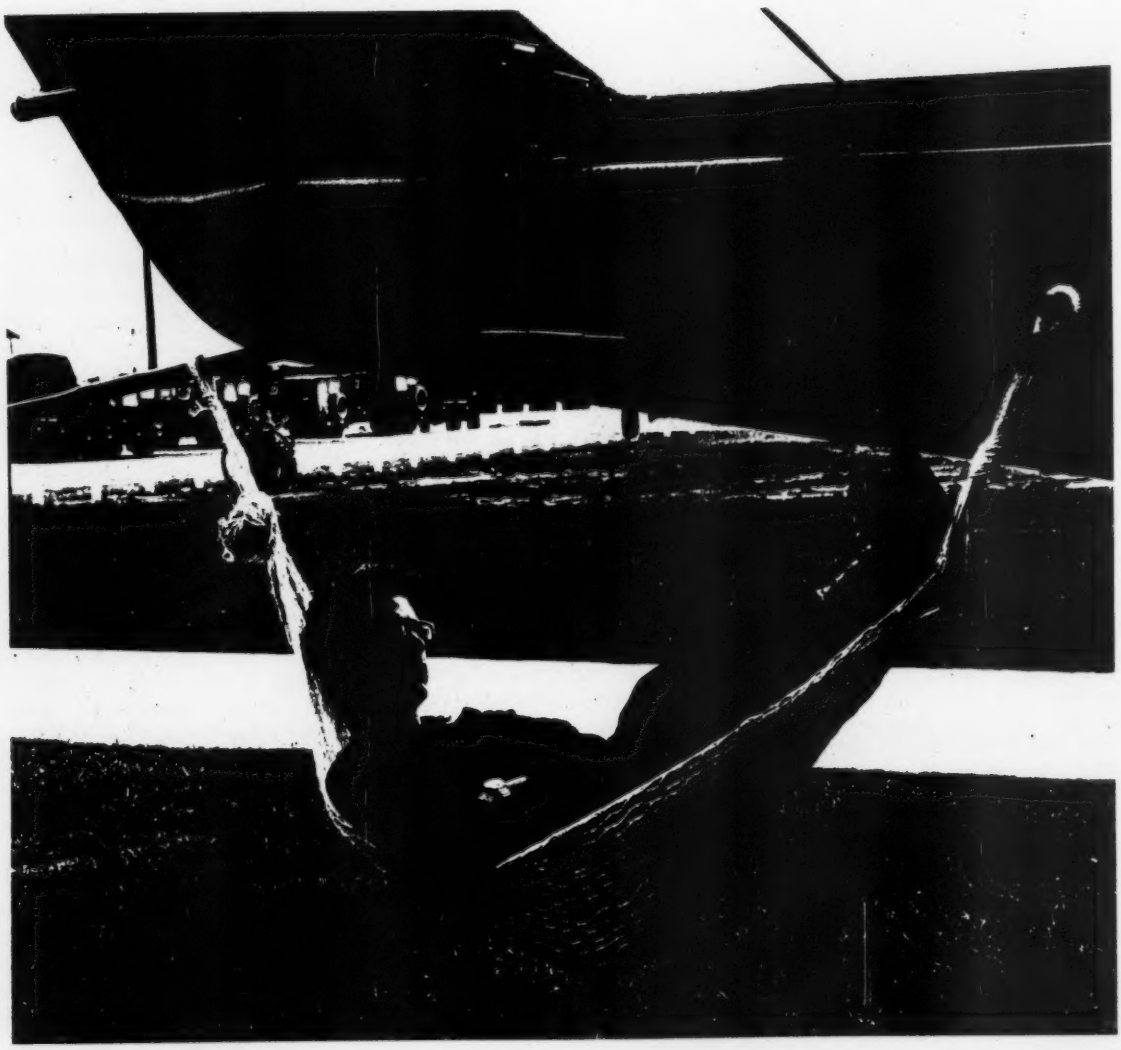
When I went into the hard right turn the bar slid over lodging against the bellcrank, jamming the ailerons controls in the full right position. This caused the aircraft to go into a tight spiraling spin. I shudder to think what would have happened if the controls had jammed at a lower altitude. The jerking of the controls finally freed the tool from the lodged position.

I feel myself and two other pilots who actually flew that aircraft were very lucky. Many times during those 97 hours on a mission there were occasions when abrupt maneuvers were performed at a low altitude. Had this bar jammed during a mission flown at 2,000 or 1,500 feet, I doubt if the pilot could have been able to recover. If it hadn't worked free in my case, there would be one more accident on the Army files, thanks to a misplaced and "unwanted" tool.

TOOLS

Professionalism

CW2 Peter J. Smith



"A lapse of professional integrity for a few minutes of fun can result in catastrophic consequences."

THIS QUOTE was taken from the Weekly Summary of Aircraft Accidents and Incidents published by the United States Army Board for Aviation Accident Research (USABAAR) during the week of 8-15 January 1971. I wonder how many of us paid any attention to it for more than a passing instant, if at all? I also wonder just how many accidents and incidents have been caused by just such a lapse or lack of professionalism?

I am sure that every aviator prides himself on his professionalism. To be called a professional is about the highest praise to be expected in aviation. And rightfully so, for to be considered a professional is to be considered a master of one's job. But more important it also means that one is a master of every aspect of his job, not just of one or several phases of it.

It is not enough just to be a good pilot to be considered a professional. It goes much deeper than that. To be a professional one must be able to recognize and to control the impulses which would cause a lapse in his performance. I am positive that every one of us at one time or another has had the impulse to make a cyclic climb, fly through a cloud needlessly, do a little contour flying when it really wasn't necessary, "buzz" a group of people on a beach or even to herd some cows. There is nothing wrong with having the impulse, it is only natural.

The problem arises when we succumb to the impulse. So we go ahead and "buzz" the beach or chase the cows. Nine times out of 10, or even 99 times out of 100, nothing unforeseen will happen and everyone involved will get a big charge out of it. But what happens that one time we misjudge the aircraft's capabilities, or our own? Where is the big charge then?

After reading this far the time-honored expression, "It could never happen to me," comes to mind. Let's face it, no one ever expects to be in an aircraft accident. Of the countless number of aviators killed or maimed in aircraft accidents just how many do you think thought it would happen? Foolish question, isn't it? But how many of us are going to go out on our very next flight and court disaster by some little lapse of professionalism, all the time thinking "It won't happen to me, I know what I'm doing"?

To think this is to infer, perhaps even subconsciously, that those countless aviators involved in aircraft accidents didn't know what they were doing, or that they weren't as capable as we are. I for one am not so egotistical as to think that I am that much better than those unfortunate ones, so my feelings are that maybe, just maybe, I had better be a little more cautious and give things just a little more thought before I do them. Is that such a bad idea?

Since I have been in the Army I have always tried to be conscious of the following: "Don't gripe about a situation or a problem unless you have a solution." Well, my solution is nothing new; it's been preached by USABAAR and many others for as long as most of us can remember. It is the duty of each and every one of us to perform in the most professional manner possible. It is the duty of each and every one of us to control the impulse to do that which would court disaster.

When you get a crazy impulse, just stop for a second and ask yourself, "What can I gain by doing this?" Then ask yourself, "What can I lose?" If everyone did this before giving into the impulse, just how many accidents could be avoided? Surely there can't be anyone of us who think that the thrill obtained by giving into an impulse such as flying contour unnecessarily outweighs the consequences that might arise from misjudging a distance or flying into a power line.

How could any "kicks" obtained even compare with the unnecessary risking of lives? If there is anyone who thinks that there is even one iota of comparability, even if he thinks it for only a split second, then he is in the wrong business and owes it to everyone to get out immediately.

This is what it all boils down to: It is the individual's responsibility to be aware of and avoid these problems. But it won't hurt one little bit for each of us to keep reminding our buddies of this responsibility. I'm sure commanders and safety officers continually "harp" on these things (or at least they should). And it's easy for us to say, "Well, that's *his* job," but we all know that it is really part of ours as well so let's give a little help.

Instead of laughing the next time some guy tells a story in the club about "buzzing the beach," and instead of going out the next day and trying to outdo him, how about gently reminding him that a little error in judgment could have very easily cost a few lives. Then ask him if he really thought it was worth it.

Maybe what we all need is a little embarrassment once in awhile to remind us that we are supposed to be professionals. It certainly isn't as high a price as the loss of a few lives.

Charlie and Danny's Write-In

Dear Danny: Change 1 in chapter 3 of the OH-58A dash 10 manual says to turn the anti-ice switch on when temperature is 4 degrees C. (40 degrees F.). The OH-58A has no anti-ice switch and 4 degrees C. is not 40 degrees F. What is the correct temperature and switch placard?

CW2 G. G. G.

Danny's answer: The OH-58A has an anti-ice system. On the instrument panel the switch is placarded DE-ICE. To activate the anti-ice system the DE-ICE switch must be turned on. The temperature will appear as 5 degrees C. (41 degrees F.) which will conform to the C. degree to F. degree conversion table. This correction will appear in change 5.

Dear Danny: It has been brought to my attention that in TM 55-1520-221-10 there is a mistake on page 2-15, paragraph 2-77. There is a description of the various transmission indicators found in the AH-1G cockpits. Paragraph 2-77 reads: "The transmission indicators consist of oil pressure indicator, oil pressure caution light, oil temperature indicator, oil temperature caution light, chip detector caution segment, oil temperature warning light and oil bypass caution light." Both the pilot and gunner caution panels have an oil temperature caution light, however there is no oil temperature warning light in either cockpit.

CW2 J. R. S.

Danny's answer: You are right. This mistake will be corrected in change 1 to TM 55-1520-221-10, dated 1 March 1971. Incidentally, if your eagle eye happens to catch any other errors in either the dash 10 or the CL, please call them to our attention so that our manuals can be made as accurate as possible, and that goes for you other cats as well.

Dear Danny: Why doesn't the U-21A airstart procedure include turning off the dead engine generator, the radar and all nonessential radio equipment. This would eliminate the heavy load placed on the current limiter when airstart is attempted with all radios and radar in the "on" position.

CPT T. E. G.

Danny's answer: No additional load is placed on the current limiters as the load on the avionics bus does not go through the current limiter during airstart. Turning the generator off is not required as the generator section of the starter/generator goes off the line automatically when the starter section is energized. By the way, if you look at the electrical system schematic (figure 2-18, sheet 1) in the U-21A operator's manual you will note that the reverse current diodes are shown backwards. This error will be corrected during the forthcoming re-issue of the manual.

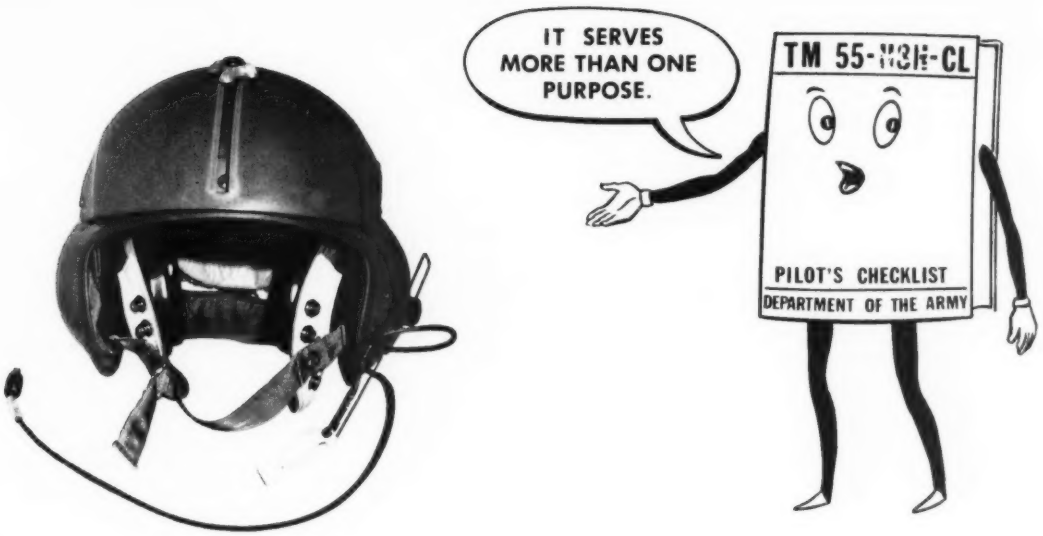
Dear Danny: In the AH-1G and TH-1G Cobra the ventilation system sprays particles of dust and dirt into the cockpit while landing, taking off or at a hover. Invariably the dust and dirt will get into the eyes of the pilot and copilot gunner. What is the proper procedure for the use of the helmet visor?

LT F. A. C.

Danny's answer: At the present time the utilization of the helmet visor is unit SOP. The future change 1 to the TM 55-1520-221-10, dated March 1971, and the checklist, dated January 1971, will reflect the proper use of the helmet visor. The helmet visor will be down before takeoff, landings or hovering. Another question will arise from this answer: What about the Cobras that have the environmental control system which gets its air supply from the bleed air system? The dash 10 further states that the Cobra environmental control system will not be used while taking off, landing, at a hover or when EGT limits the use thereof.

Dear Danny: In comparing the TM 55-1520-209-10, CH-47A, and TM 55-1520-227-10, CH-47B and C, the engine compartment fire inflight procedures differ. The procedure for the CH-47A—if an engine fire occurs perform the following:

- Descent—establish.
- Crew—alert.
- Presence of fire—check (if an engine compartment fire is confirmed, complete the remainder of the checklist).
- Engine condition lever (affected engine)—stop.
- Fire control handle (affected engine)—pull. NOTE: When a fire control handle is pulled, the respective engine fuel valve is closed and the respective fire extinguisher agent switch is armed.
- Fire extinguisher agent switch—select bottle number 1 or bottle number 2 depending upon the severity of the fire; it may be necessary to discharge both bottles. CAUTION: Only



two fire extinguisher agent containers are provided. If the agent from both containers is used combating a fire in one engine compartment, no agent will be available should a fire occur in the other compartment.

- Fuel valve switch (affected engine)—closed.
- Crossfeed switch—as required.
- Fuel booster pump switches (affected engine)—as required. CAUTION: Do not restart the engine as a fire may start anew.

The procedure for the CH-47B and C—if an engine fire occurs perform the following:

- Presence of fire—visually confirm (the flight engineer will do this and he will monitor it throughout the remainder of the flight).
- Air speed (if inflight)—beat single engine air speed.
- Crew—alert.
- Engine condition lever—stop.
- Establish single engine flight for an approach to the nearest suitable landing area.
- Fire control handle—pull. NOTE: When a fire handle is pulled the respective engine fuel valve is closed and the fire extinguishing agent switch is armed.
- Fire extinguishing agent switch—select bottle number 1 or bottle number 2 depending on the severity of the fire; it may be necessary to use both bottles. WARNING: If the fire is not put out using both bottles, extended flight should not be attempted. An immediate landing should be made. CAUTION: If the fire is in the engine area only and the portable fire extinguishers can be used, an attempt should be made to put out the fire. Once the fire is out, do not try to restart the engine until the cause of the fire has been found and corrected.
- Fuel valve switch—close (CH-47B).
- Crossfeed valve switch—as required.
- Fuel booster pumps switches—as required.

Why do procedures in the dash 10s vary so much between the CH-47A, the CH-47B and C?

LT P. O. V.

Danny's answer: The procedures should appear the same and will be corrected when the next change comes out.

Dear Danny: My CL for the Mohawk (TM 55-1510-204-CL/4) says that the transponder should be turned on as the last item in the before takeoff check. Section II of the FLIP on page II-70, paragraph 6a states that the transponder should be operated as late as practicable. What is a good solution to this problem?

C. A. B.

Danny's answer: The solution to this problem has already been resolved and changes to the applicable checklists and dash 10s should be forthcoming. In order to better satisfy the referenced section in FLIP, operation of the transponder will be moved from the "Before Takeoff" section and placed in the "Lineup" check.

1. Flatiron up: 1 minute, 10 seconds

Story by WO1 Michael D. Sheley
Photos by Captain Tom Greene

2. Seconds counted as Flatiron races to take off: 1 minute, 17 seconds

3. Up and away: 1 minute, 20 seconds

A loud wail pierced the air . . .

MISSION: FLATIRON

. . . Cairns Crash Control Center rang the emergency bell three times! "First up's hot . . . let's go!" yelled the captain.

The air still vibrates with a lingering ring as the clumping of combat boots rises, distributing its effect through the control center. The building subsided to a whisper as indiscriminate figures crowded the windows to view an almost everyday occurrence at Cairns Army Airfield, Ft. Rucker, Ala.

Stop watches clicked, Flatiron made it in record time—1 minute and 20 seconds from briefing room to liftoff in their UH-1H. Flatiron is the operational call sign of the crash-rescue team at the U. S. Army Aviation School.

The Flatiron team is made up of highly skilled, professional Army aviators. Each usually has completed a tour or two in the Republic of Vietnam. Men of mercy whose goal is to expedite crash-rescue evacuation as smoothly and efficiently as the situation will allow.

Time and training are the barriers that these men face daily. Time that is not spent on rescue missions is expertly turned into the most crucial aspect of their and our lives: training.

A man in top physical condition with hundreds of hours of flying time is not enough for Flatiron; he needs more. Maturity and integrity are

Left: CW2 Robbinson, Flatiron pilot, reviews "Black Book" for instant reference. Below: Pilots and crew members participate in one of many learning sessions

out of the Cairns field area.

Rarely will you find the Flatiron men in a relaxed state. Their job demands constant study to keep up with the ever-changing charts, maps and training. A perpetual record of all training is kept at the Flatiron office to keep everyone affiliated with the rescue team informed of crucial points in the aviation school's training schedule.

The Flatiron crew consists of an aircraft commander and his pilot, two firefighters, one medic and a military policeman. Their duties are listed below:

- Aircraft commander—complete responsibility for the mission and his aircraft.
- Pilot—to assist the aircraft commander in radio calls and flying the aircraft.
- Firefighters—to extinguish fires at the crash site and pro-

stressed because this is in direct relation to the good, solid judgment that is a necessity with the Flatiron mission.

Most Flatiron aviators hold tactical instrument ratings, but they are constantly studying and training to attain the standard instrument rating.

The Flatiron teams have as many as six emergency calls a day, some of which are lifesaving, some routine. They are called into action by a set of alarm bells originating in the crash control center. When crash control receives an emergency call, the alarm is sounded according to what the situation demands:

- One bell: fire truck alerted to Cairns field.
- Two bells: Flatiron and crash truck alerted to field.
- Three bells: Flatiron called

...de rescue assistance to downed crewmen.

• **Medic**—to give victims first aid and prepare them for the flight to the hospital.

• **Military policeman**—to secure the crash site and allow only authorized personnel in the area.

The Flatiron mission also includes hospital-to-hospital emergency evacuation assistance to the local civilian populace. The Flatiron chopper, a UH-1H, has a special airborne incubator to transport newborn babies to the Children's Hospital in Birmingham, Ala.

A loud wail shrieks across Cairns. Crash control rings the emergency bell three times and Flatiron is on the way . . .

"Vanderpool's Fools"

OFFICERS

CPT Stanley E. Ballentyne
CPT Ernest L. Boswell
CPT Charles W. Jones
CPT John R. Ford
CPT Howard A. Huntsman
CPT John D. Roberts

LT George F. Blanchard
LT Thames M. Economos
LT Robert A. Jones
LT Robert R. Chedester
CWO Charles L. Brameier

CWO John L. Lawlor
CWO Cecil W. Williams
CWO Thearon M. Cross
CWO James D. Lombard
CWO Lawrence C. Hammond
CWO Clarence J. Carter

ENLISTED MEN

MSG L. O. McDonald
MSG W. J. Quinn
SFC J. M. Bingham
SFC W. C. Cooper
SFC J. H. Gladson
SFC W. Jenkins
SFC J. Rosado-Rodriquez
SFC M. R. Sherrer
SFC P. J. Soublet
SFC A. Thompson
SFC E. Vasquez
SFC F. E. Weedon
SP1 L. H. Weeks
SGT A. B. Andrews
SGT R. E. Coker
SGT R. Gates
SGT L. Hopkins

SGT J. C. Johnson
SGT H. M. Mills
SGT L. L. Prine
SGT E. E. Spaichler
CPL K. Gombooz
CPL O. H. Haughey
CPL G. L. Roberts
SP3 J. J. Graham
SP3 E. Harris
SP3 A. E. Mason
SP3 M. C. Overman
PFC C. W. Ayers
PFC J. E. Davis
PFC J. B. Elliott
PFC C. J. Gahn
PFC M. R. McCully
PFC R. Ricks

PFC R. P. Somerville
PFC H. Wyatt Jr.
PVT R. E. Abbott
PVT W. E. Coursey
PVT A. C. Fordyce
PVT J. W. Garrett
PVT H. E. Hill
PVT F. A. Johns
PVT S. H. Kmiec
PVT E. J. Konzelman
PVT D. G. Lewis
PVT R. J. Long
PVT M. R. Mendoza
PVT D. Porter
PVT A. J. Rogers
PVT J. H. Spivey
PVT W. D. Watson

The Armed Helicopter Story
Part II

Lieutenant Colonel Charles O. Griminger

IN JUNE 1956 Brigadier General Carl I. Hutton, commandant of the U. S. Army Aviation School at Ft. Rucker, Ala., asked Colonel Jay D. Vanderpool to head his experimental helicopter armament program. COL Vanderpool accepted eagerly and set about to assess what he had onhand to work with. There were only a few helicopters, a few guns and rockets, and no gun sights. But he had one big asset— a group of dedicated aviators and enlisted men willing to donate their free time to his cause. This team of men became known as "Vanderpool's Fools." They worked long days and through weekends developing helicopter weapons systems. They all worked under pressure as there was a feeling that the whole project might be canceled before they proved their concept.

Captain Harold Hennington, an engineer, and Captain Charles Jones became expert machinists. Captain Stanley E. Ballentyne had a group of enlisted men who did design work and labor in support of the effort. Captain James Montgomery was the team's chief test pilot for early models.

Hardware was difficult to obtain, many scrounging trips were made to U. S. Air Force depots, Navy supply dumps and wherever the relics of war could be found. Bomb sights, machine guns, sights and pieces of scrap were brought back.

As interest was generated in the project, the little group began to grow. On 5 March 1957 an unnumbered U. S. Army Aviation Center (USAAVNC) Memorandum directed the organization of a Sky Cavalry Platoon (Provisional). This unit consisted of 11 officers, 16 enlisted men and 10 helicopters. U. S. Army Aviation School (USAAVNS) Memorandum Number 8 placed this unit under the operational control of the Director, Department of Tactics, on 8 July 1957. The unit dubbed "Sky Cav" was soon functioning.

In order to eliminate the confusion that existed over different types of "Sky Cavalry," the unit was redesignated the Aerial Combat Reconnaissance (ACR) Platoon, Provisional (Experimental) (figure 1) in November 1957. On 24 March 1958 the unit was reorganized as the 7292d Aerial Combat Reconnaissance Company (Experimental) by Third Army General Order 67 dated 20 March 1958. The unit was organized under TD Number 92-7292 dated January 1958 and assigned the following mission:

> **"To support the Army Aviation School with 100 percent of its personnel and equipment in the conduct of approved training programs and in the development of tactical doctrine, organizational data, operational concepts, material requirements, tactics, techniques, and procedures for employment of a completely airmobile combat force."**

The ACR Company was patterned after the "Sky Cavalry" organization of the Armair Brigade Study submitted by the USAAVNS and was designated for school and not tactical use. After its reorganization the unit was placed under the 2d Battle Group, 31st Infantry Regiment, as part of the school troops at Ft. Rucker. It was later redesignated again—this time the 8305th Aerial Combat Reconnaissance Company by Third Army General Order 55 dated 25 March 1959.

"VANDERPOOL'S FOOLS" or at least many of them are pictured (above left) after a training exercise at Ft. Bliss, Tex., in 1958. Some of those early members of the ACR Company are listed to the left . . . their insight, initiative and perseverance lead to the development of the helicopter as an effective weapon. In the Republic of Vietnam the armed helicopter provides the ground commander with a versatile and immediate response—few commanders go into combat without them—yet during the development of the helicopter as a weapons system these pioneers were called "fools". . . . Today it is a distinct honor to be one of "VANDERPOOL'S FOOLS"

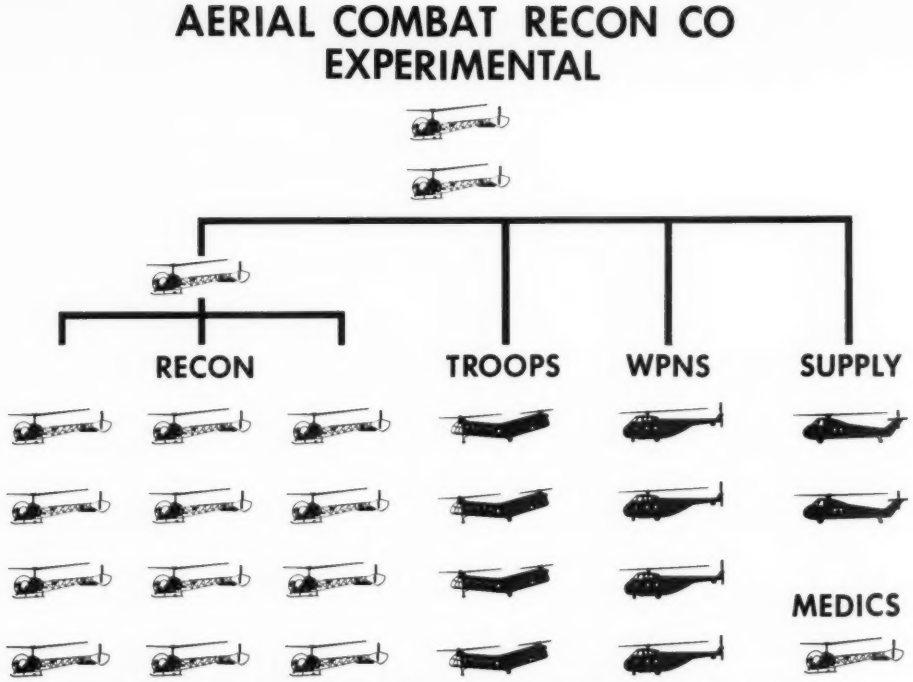


Figure 1 is the structure of the ACR Platoon Provisional (Experimental) as it was reorganized as the 7292d Aerial Combat Reconnaissance Company (Experimental) in 1958

Colonel Vanderpool (left) is shown talking with Colonel William Tuck (center) and Captain Stanley Ballentyne (right), first commander of the ACR Company

On 24 September 1962 the 8305th ACR Company became Troop D (Air), 17th Cavalry. Troop D was then moved to Ft. Benning, Ga., where in 1963 it became part of the 3d Squadron, 17th Cavalry Regiment, 11th Air Assault Division (T). Troop D's designation was later changed to A Troop. The 3/17th Cavalry was redesignated the 1/9th Cavalry and sent to the Republic of Vietnam in 1965 as part of the 1st Cavalry Division (Airmobile).

The men of the ACR Company formed a closely knit fraternity calling themselves the "Royal Order of the Fighting Hover Bugs." CPT Ballentyne was the first commander of the original unit and Captain J. D.

Roberts the first executive officer. Later commanders of the unit were Major Frank G. Brown, Captain Harry E. Archer, Major Carrol M. Cook Jr., Major Philip D. Jones, Major Robert M. Shoemaker and Captain Robert E. Oberg.

Members of the unit soon acquired nicknames. Chief Warrant Officer Lawrence C. Hammond was known as "Chief Piddler"; CWO Clarence J. Carter as "Chief Scrounger"; Captain W. F. Gurley as "Chief Operator"; and CWO James D. Lombard as "Chief Inventor."

"Vanderpool's Fools" developed a great deal of spirit and worked long, hard hours to achieve their goals. Working with salvaged equipment they accomplished an almost single-handed incubation of the helicopter armament program in the U. S. Army. They had no formal research and development assistance, no designers and no evaluation personnel. The group originally worked in the post machine shop and later set up a shop of their own. Anyone in the unit who had an armament idea could have it built and tested. Many ideas were tested and several resulted in new innovations for helicopter weapons systems.

In addition to weapons systems for helicopters, the men of ACR also developed tactics for employment of armed helicopters.

As systems and tactics took shape training exercises were opened to the public in an effort to sell the newborn ideas of the "Sky Cav." On 27 March 1957 ACR left Ft. Rucker to give its first offpost glimpse of emerging

Figure 2

WEAPONS SYSTEMS DEMONSTRATED DURING THE ASSOCIATION OF U. S. ARMY SYMPOSIUM 7 JUNE 1957*

HELICOPTER	ARMAMENT
OH-13	Four M-2 caliber .30 aerial machine guns and four 8 cm Oerlikon rockets
OH-13	Two caliber .50 M-2 aerial machine guns
OH-13	Twenty tube rocket launcher for the T-290 FFAR
UH-19	Two pods of fifteen 2-inch rockets each
H-25	Two pods of sixty-six 1.5-inch rockets each and two caliber .30 machine guns
CH-21	Twin caliber .50 machine gun turret
CH-21	Two caliber .30 machine guns, two caliber .50 machine guns and eight Oerlikon rockets

*Data was extracted from the demonstration's written narration

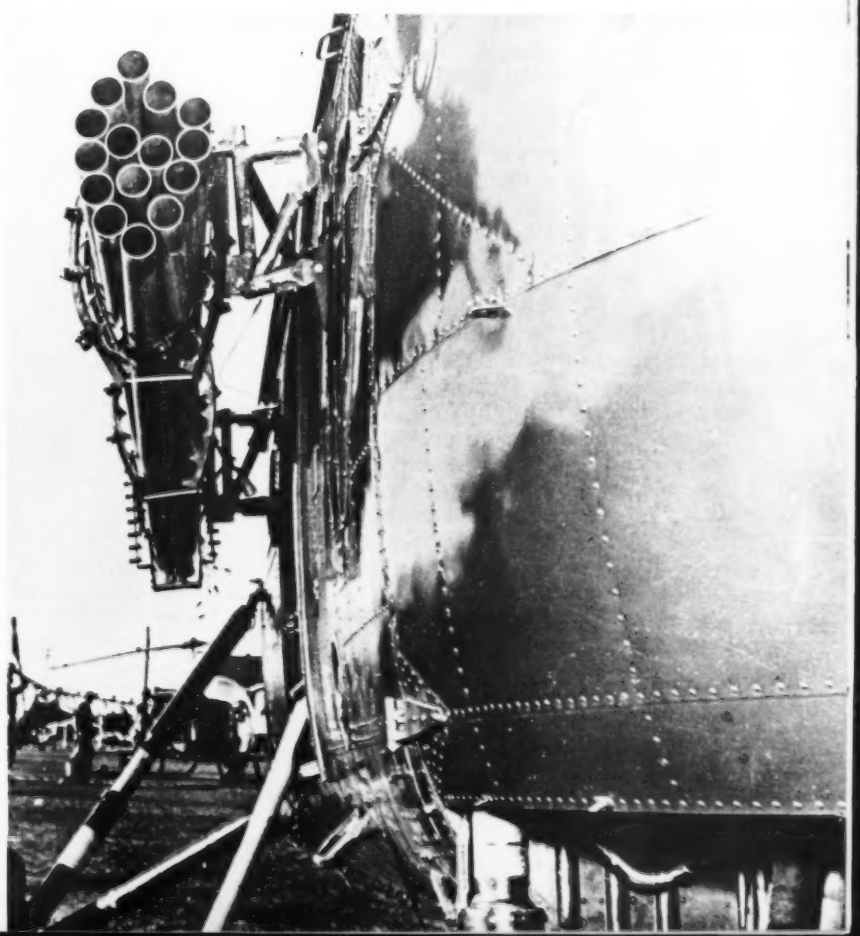


Figure 3

Some of the tubes went with the rockets when this 2.75-inch FFAR system was fired; an analysis showed that the experimental system did not provide for expansion

Figure 4
A short circuit on this 2-inch rocket system fired all the rockets at once and caused oxygen starvation to the engine

airmobile tactics. One contingent conducted an exercise before the U. S. Armor Association at Ft. Knox, Ky., while another was impressing members of an industrial symposium at Ft. Benning.

By mid-1957 the team had acquired six OH-13s, two CH-21s, one H-25 and one UH-19—just in time for its most significant training demonstration to date. The Army Aviation-Industry Symposium was conducted at Ft. Rucker on 6 June 1957 and was sponsored by the Association of the U. S. Army. At this presentation the "Sky Cav" demonstrated the weapons shown in figure 2. Industry's response was most encouraging.

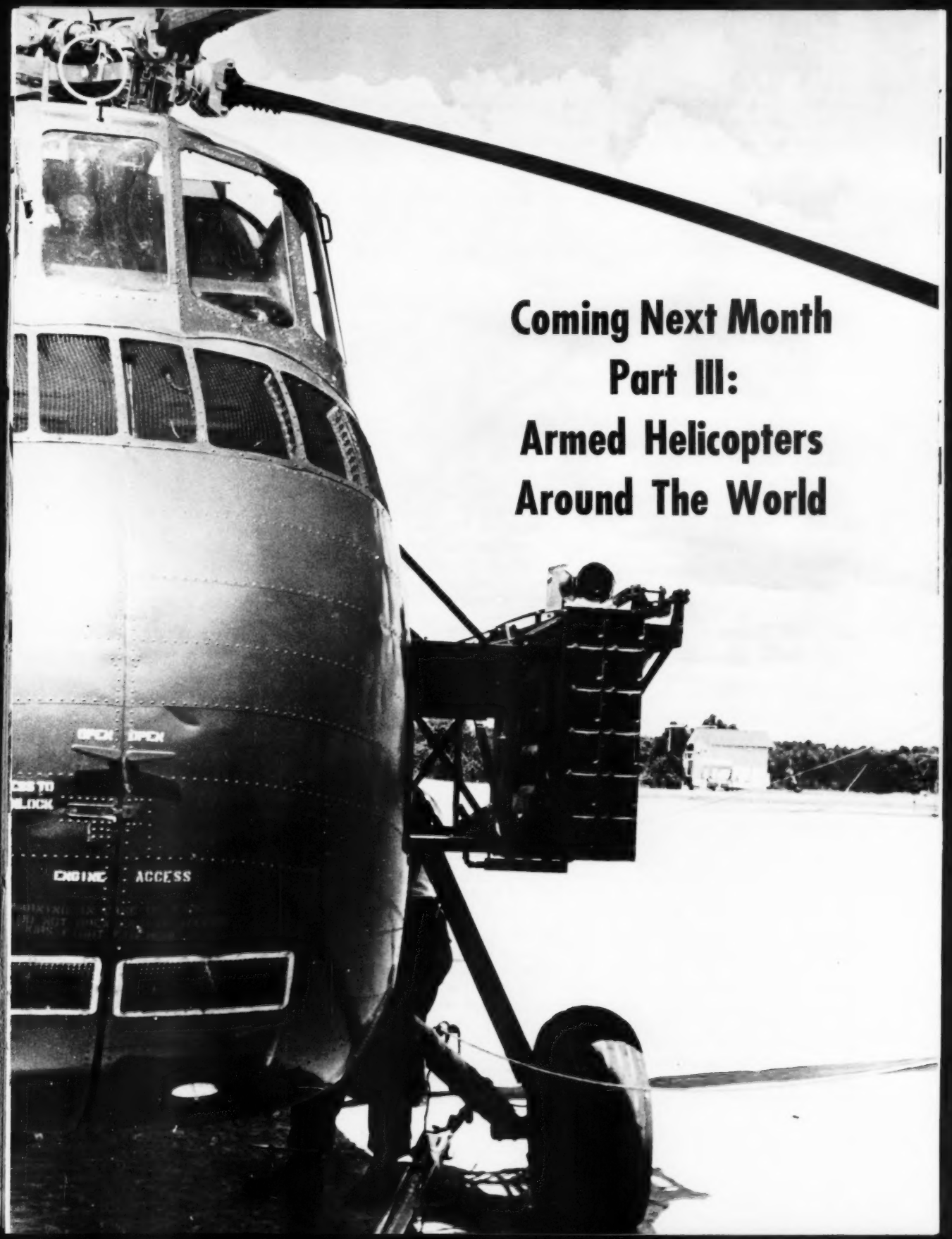
On 10 June 1957 ACR performed before the Ordnance Association Conference at Redstone Arsenal, Huntsville, Ala. For this demonstration the team consisted of the same helicopters, except the OH-13s were armed with four caliber .30 machine guns and eight Oerlikon rockets. The "Sky Cav" also performed during the Joint Civilian Operations Conference (JCOC) at Ft. Benning in October 1957 and again in 1958. Another big exercise was conducted at Ft. Bliss, Tex., in July 1958 before an impressive list of top military officers and civilians. All of these exercises generated a great deal of command interest in the armed helicopter.

Despite the early success enjoyed by ACR, not all went perfectly. Figure 3 shows what happened to a 2.75-inch folding fin aerial rocket (FFAR) system that did not provide for expansion, causing the rockets to take some of the tubes with them when fired. Figure 4 shows a 2-inch rocket system which caused oxygen starvation to an engine when a short circuit fired all the rockets at one time. Also, a few helicopters were damaged when they were overloaded with weapons and ammunition and the 2-inch rocket gasses were found to cause severe corrosion to the firing helicopters.

Captain J. D. Roberts was injured when the door of his OH-13 helicopter vibrated open and deflected metal flew into the cockpit. ACR stopped using doors after that on the OH-13.

CPT Roberts laid claim to being the first rocket-powered helicopter pilot. His claim came about when rockets became hung up in the firing kit on his OH-13. Fortunately the helicopter was equipped with a jettison capability and CPT Roberts was able to land the helicopter without further incident.

Considering the circumstances under which experiments had to be conducted, ACR made an outstanding contribution to the evolution of the armed helicopter, and its influence soon spread around the world.


Coming Next Month
Part III:
Armed Helicopters
Around The World

Provided by the Society of U. S. Army Flight Surgeons

Major Nicholas E. Barreca, M. D.

Aeromedic

look out below

IN THE MAY 1971 AVIATION DIGEST the subject "Visual Illusions" was addressed by a U. S. Air Force colleague Lieutenant Colonel Donald G. Pitts, USAF, BSC (Ret). That article presented many interesting aspects of our visual environment which are easily and often misjudged. The several examples cited were quite typical of fixed wing approaches and landings, as well as must normal helicopter approaches and landings. However, there are certain phases of rotary wing flight that lend themselves to similar, but often opposite, illusions to those one might expect in a more typical fixed wing mode of flight.

The helicopter autorotation is an especially different type of landing requiring a series of distinct and precise control movements dependent upon perception of depth. Perception of depth is a complex function dependent upon many visually perceived environmental clues. Often aviation personnel think of depth perception in terms of three-dimensional attributes such as one experiences when view-

ing with a stereoscope. Certainly they most often feel such perception requires the use of two eyes. This is only partially correct. In reality, most clues to depth can be perceived with only one eye (monocular depth perception). The binocular and stereoscopic clues are refinements and extensions of these. Many monocular clues integrated by the visual system and brain ultimately determine our control movements.

The artistically appreciated characteristic of geometric perspective is one. It is most familiar in the example of converging parallel lines in the distance such as with railroad tracks coming from the distance. Based on experience, the known size of objects will determine our estimate of distance when a specific image size is projected on the light sensitive layer of the eye. The detail or texture of a familiar object will also determine the sensation of distance we perceive. Still another clue is motion parallax. Motion parallax is the apparent movement of objects in the visual field. If one were to fix on a given point in his visual field, he would find that objects closer than that point move opposite to his direction of movement, while objects beyond that point of reference move in the same direction.

These and several other monocular clues are used by the rotary wing aviator during autorotation to govern such control movements as the deceleration, initial and final pitch appreciation. Let's examine then the effect of certain runway characteristics as they may affect our perception of depth. The first is runway width. Autorotations to *runways* are perhaps oriented to the student or training environment, seldom occurring in the operational environment. Nevertheless, many autorotation accidents occur under this condition. When discussing the effect of runway width, we must assume the pilot is approaching an unfamiliar runway lane after having consistently practiced on one of another width. Thus, his relative size clues will be based on those of the familiar runway.

It is hypothesized that runway width will primarily affect the initial and final pitch application of an autorotation. Since these take place at approximately 15 feet and 3 feet from the ground respectively, the pilot will be visual impressed by the runway's lateral sideline clues.

Let's first look at one's autorotation to a wider than normal runway lane. Such a landing would make the pilot feel lower than normal due to his relatively smaller visual reference angle with the side of the runway at equivalent heights above the ground (see figure 1). The pilot would tend to pull pitch too soon resulting in a falling landing—short, hard and (pardon the expression) broken.

In an autorotation to a narrower than normal runway lane just the opposite situation occurs. The pilot would feel higher than normal due to a relatively larger visual reference angle with the side of the runway at equivalent heights above the ground (see figure 2). The pilot would tend to pull pitch too late resulting in long, hot (sparks flying) and/or just plain bent and broken landing.

This effect is just the opposite to that which takes place when one sets up a normal approach to a wider versus narrower than normal runway in the fixed wing way of looking at things. The important thing to realize is that differences exist. Don't be lulled into complacency by achieved perfection in the familiar environment. *Look out below* when you are suddenly forced to perform in a less familiar one.

There are many similar pitfalls in the operational environment. Too often the pilot is rudely awakened to this fact when his emergency landing is to the seemingly shallow yet bottomless pit of an open body of water, large desert, poorly detailed or defined area or snow-covered expanse. Commonly called the depth perception illusion, this misjudgment also occurs at night (where depth perception is reduced to a minimum) and is equivalent to the wider than normal runway "drill."

Perception of depth is perhaps also critical with helicopter autorotations to sloping runway lanes. The effect of runway slope, it is hypothesized, would probably most profoundly affect one's decision to effect the deceleration. The decision height for deceleration is often based upon runway clues seen ahead at approximately 100 feet above the ground. The application of initial pitch might similarly be influenced by the apparent height above the runway just to the front.

In autorotating to an unbeknownst upsloping lane, the pilot would feel lower than normal due to a shorter relative visual distance to a given touchdown point on the ground (see figure 3). This would cause the pilot to establish his deceleration too soon or to a greater extent than necessary. Further, he might apply initial pitch too soon resulting in a short, hard and broken landing. This upsloping situation is probably readily compensated for by the pilot unless the slope is marked.

The downsloping autorotative landing could be more crucial. The pilot would feel higher than normal due to a shorter relative

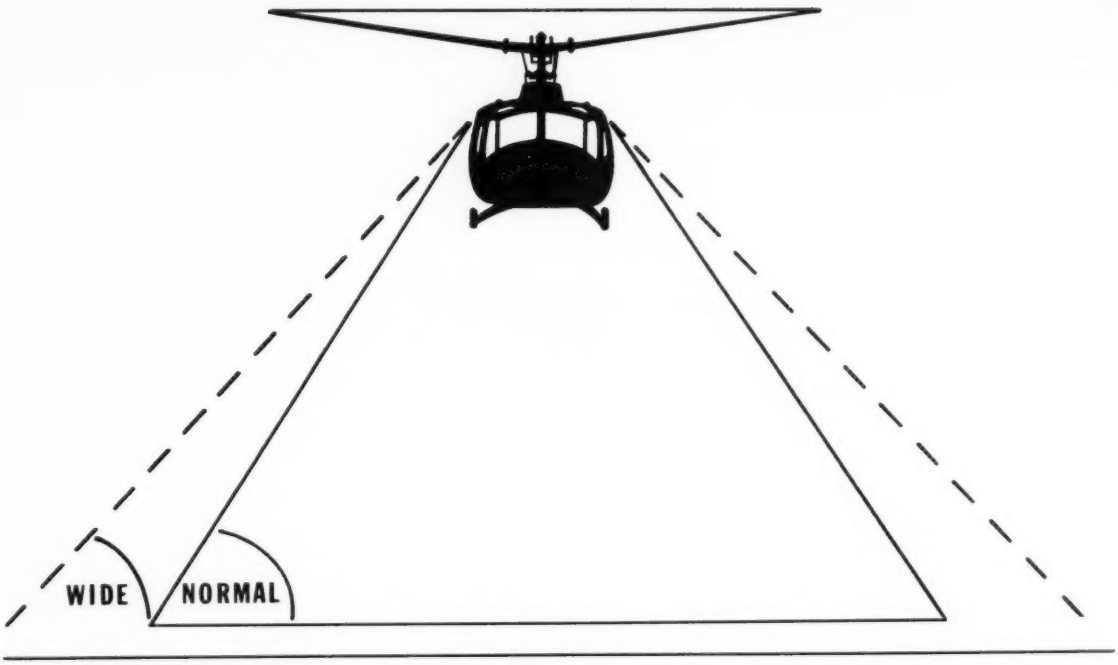


Figure 1

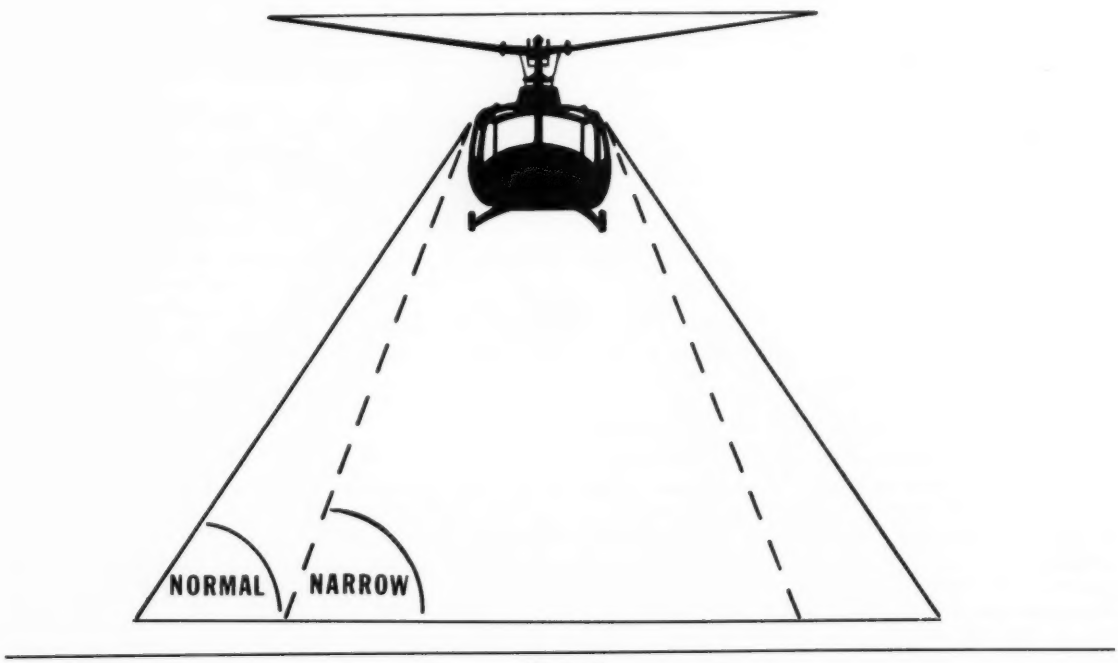


Figure 2

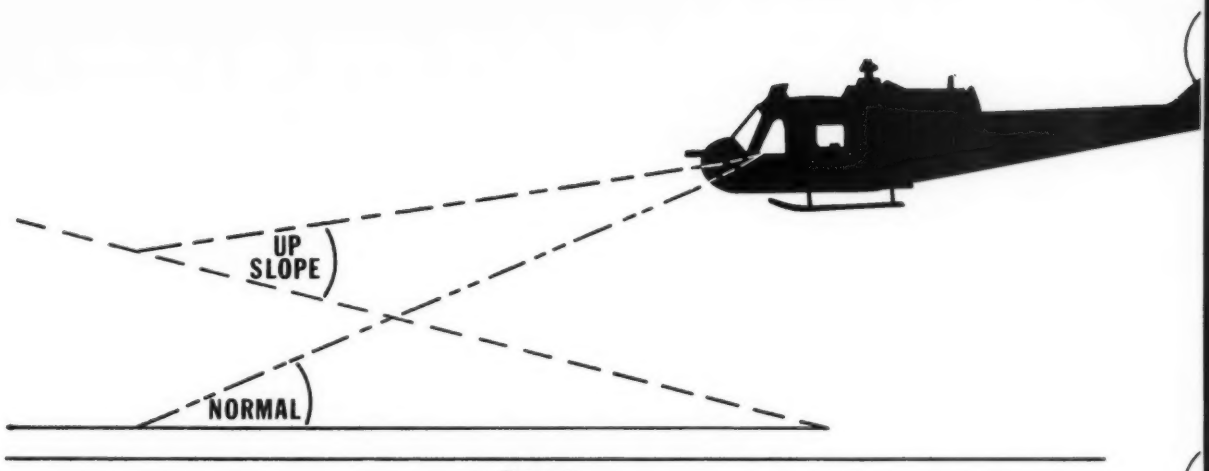


Figure 3

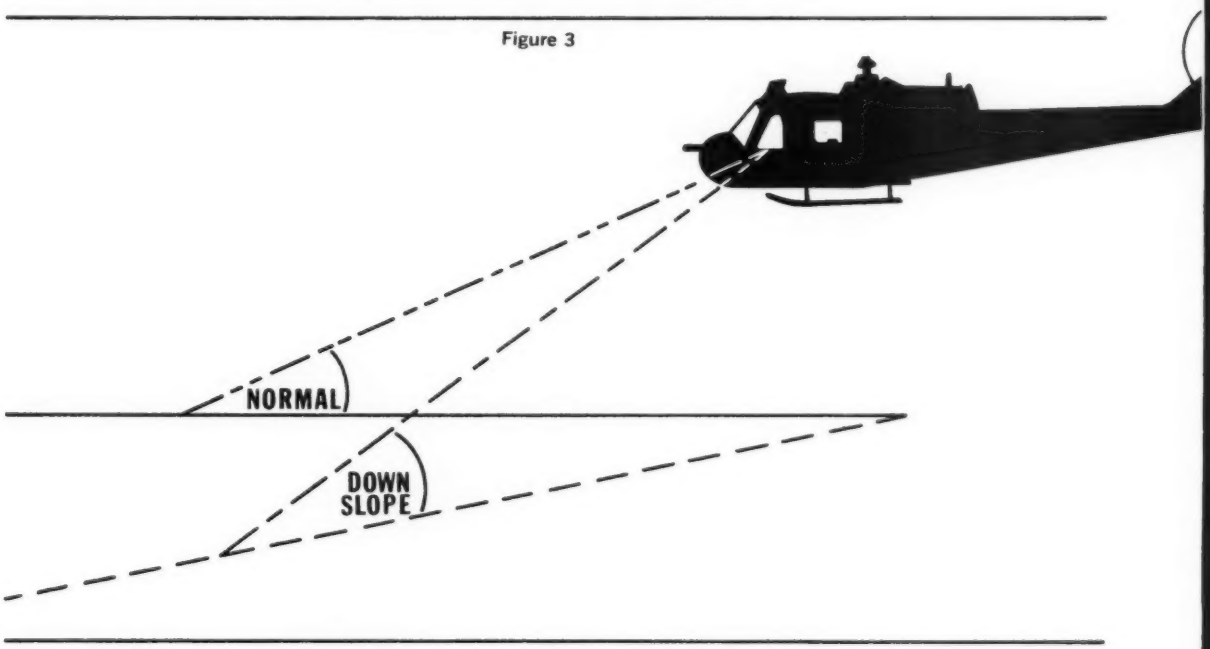


Figure 4

visual distance to a given touchdown point on the ground (see figure 4). This might cause the pilot to decelerate late or pull initial pitch too late, resulting in a long, hot and broken landing. Usually the ole stinger gets a workout! Worse yet, off comes the tailboom. This is invariably followed by a sincere feeling of inadequacy, failure, disappointment and misery.

Again, these illusions over the runway lane are opposite those experienced in a normal or distant approach to a runway. Illusions then would approximate those of a fixed wing approach. These are not uncommon operationally on approaches to a pinnacle or excavated area.

Army helicopter pilots must make these adjustments on a daily basis in the operational environment. Seldom do landing zones take on the fairyland aura of the 10,000-foot, beautifully engineered level runway at Cam Ranh Bay, Republic of Vietnam. More often it is a battle with upslopes, downslopes, sideslopes, tree stumps, rat holes and elephant grass. So, *look out below*. A short recon may make the difference between a somewhat lusterless but unscathed landing and a classy but painful embarrassing crash.

Aircraft Availability:

THE NUMBERS GAME

Captain Richard B. Carey

IS ARMY aviation getting bigger and better or just bigger?

Having been the maintenance officer in a direct support maintenance company in my second aviation tour in the Republic of Vietnam, I encountered many interesting growing pains which are a result of the expansion of Army aviation. This assignment gave me the opportunity to monitor and support about 250 Army aircraft both in maintenance and supply. It also helped lead me to the conclusion that:

- Army aviation has come a long way in a short time, but still has a long way to go.
- A recurring program is needed to evaluate and assist maintenance units and thereby help keep Army aviation moving in the right direction.

The highest maintenance echelons seem to have the right ideas about planning and programing, but somewhere down through the long chain of command, a great deal of this expertise seems to get lost. Subsequently, improper procedures develop, especially in the combat environment of Vietnam where the aircraft availability rate can make an organizational commander a slave to statistics and hamper essential maintenance procedures.

It seems that the days have gone when an aviation commander was rated on his combat success in terms of enemy killed and captured or upon effective leadership. Instead, it seems the items most important to a good rating in an aviation unit are: aircraft availability, command maintenance management inspections and reenlistments. Such standards for success distort the real mission of line aircraft units. An aviation commander often finds his career hanging by a thread if aircraft availability drops below the demanded readiness percent. He finds that his seniors rarely consider other crucial points such as the lack of available pilots to fly the aircraft or the fact that there were missions planned for no more than 60 percent of his fleet. The word is 85 percent whether the aircraft can be effectively utilized or not. Of course, one should strive for the highest possible aircraft availability rate because aircraft are essential to the airmobile concept, however, aircraft availability goes too far when quality is sacrificed for a high percentage.

I recall too many times when an aviation unit commander has come into the maintenance facility with his nerves shot because one of his aircraft was in for maintenance and his availability had fallen below the standard. He usually complained that his superiors were jumping down his throat and he has chewed out his maintenance officer numerous times, all to no avail. Though he has no pilot to fly the aircraft (even if it did come out of maintenance), he must still worry about how it looks on his availability chart. When he is told that the aircraft will be down for

at least two more days and that in many areas simple preventive maintenance would have avoided some of the repairs, he responds with something like this, "They are flying the heck out of my aircraft and I just don't have anything to say about it. I don't have time to wash them at night and I can't keep them down for small repairs. I have to wait until they come in for periodic inspection and then I can get all the small repairs done while the aircraft is down anyway."

The answer can only be, "Sorry sir, but that's maintenance!"

He walks away depressed, trying to think of something to tell his boss. Many a career in Army aviation has been endangered by this slavish devotion to statistics. If there are only 10 aircraft in a unit in the first place and two are scheduled for periodic maintenance, that leaves only 80 percent instead of the "required" 85 percent. Should another ship go down that makes 70 percent—heaven forbid. Figures do not lie, they just distort the true picture.

In one instance, a unit asked our direct support unit (DSU) to make an evaluation on an L-13A engine with excessive oil consumption. After evaluation we determined that an engine change was necessary. The engine change could have been accomplished in our engine shop in 1 day plus time for a test flight. But, the unit maintenance officer elected to change the engine at his own unit because he could report the aircraft as being authorized stand down (ASD) and thereby maintain the magic number even if the aircraft was in his own shop for 2 or more days. Even though listing the aircraft as ASD meant that the aircraft could be ready for a mission within 2 hours, the officer felt that it was a necessary deception to maintain his excellent record. If the aircraft were to have been serviced at our DSU, it would have been listed as nonflyable and the availability percentage would have reflected the loss of this aircraft. Such examples are common occurrences and serve to remind all of the need for change.

Where does the numbers game originate? The game is so widespread that it must begin at division level or higher. A commander that has at least 5 years of aviation experience cannot help but have an understanding of maintenance. This is a great advantage to him because he can monitor his operations and maintenance in the scheduling of aircraft. Usually this commander can keep his own head above water and control his aircraft availability with good management. Extra higher echelon command emphasis on availability rates does not contribute to organizational level maintenance efficiency. Senior officers with less aviation maintenance experience than officers under their command must depend upon their maintenance officers for guidance.

Here is a job that offers experience in depth and great rewards. However, the rewards must be provided by the officer himself because no one knows he exists until the availability drops below that 85 percent mark. He can, however, look forward to the day when he will leave the unit with a clear conscience because he has provided his pilots with quality workmanship and safe aircraft.

Even though the technical supply system has improved immensely, it still takes key personnel to go out and conduct a lateral search for a part. This function usually requires some of the best people. In addition, adequate personnel and equipment are not available in accordance with the table of organization and equipment (TOE) and table of distribution (TD) schedules. Because of these handicaps it is a wonder that many units are able to find time and personnel for even the most elementary maintenance chores. An honest reevaluation of the detachment system and TOE requirements for maintenance units is urgently needed.

Despite the built-in problems, there are things that can make the maintenance officer's job easier:

- His personnel must be willing to put in long and thankless extra work hours.
- His pilots must treat the aircraft with respect and provide him with assistance by writing up deficiencies as they find them.
- The commanding officer must understand what kind of repairs have to be performed and how long it takes to perform quality maintenance. Continued dependence on accelerated maintenance at all costs can only hamper the improvement in maintenance techniques.
- Command emphasis must be placed on the education of aircraft maintenance personnel.
- Contact teams of experienced personnel from the higher echelons of aviation maintenance should be sent down on a continuous basis to monitor all levels of maintenance. These teams should be hand-picked personnel who are given a degree of control over what can and should be performed at all levels.

The Army's airmobile concept cannot continue to be successfully developed if aircraft maintenance is allowed to fall by the wayside.

Continued from page 1

VIEWS FROM READERS

Sir:

We are seeing a change in the composition of our aviator force in stateside units. This is primarily the result of the early outs of the aviation warrant officers. The end result will be many new aviators finding themselves on their own much sooner than before. This is not necessarily all bad. We shouldn't have to spoonfeed an aviator just because he is a recent graduate of flight school.

He should be given an opportunity to "get his feet wet." This means to give him some responsibility and authority and expect some results. He must also be given some competent command guidance to carry out these missions. We are losing too many aviators and aircraft because of grey areas and misunderstanding as to the aviator's authority to reject a routine mission based on his estimate of his capabilities and equipment available.

Reasonable local guidelines should be set. For example, the night minimums for helicopters is 500 and 1 over flat terrain according to AR 95-2. I believe that this regulation must have been written considering a fully instrumented aircraft and instrument qualified pilots. A more realistic local guideline for noninstrument rated aviators would be 1,000 and 3 for night operations. And for observation aircraft with no attitude indicator the minimums should be higher.

The attitude of commanders and more senior aviators will also determine to a great extent whether or not these young aviators meet an untimely end. There is a lot of lip service given to aviation safety but this is not very effective if our actions say something else. Consider a few hypothetical situations:

• A commander signs his name to a directive that anyone caught speeding will lose his driving privileges and then goes out to his staff car and allows his driver to exceed the speed limit.

• An instrument examiner files a flight plan to a destination that is forecast to be below minimums upon arrival because he has a VIP on board.

• A U-8 instructor pilot takes off from one airfield and flies across town to another airfield SVFR with 400 and 1 (emergency mission to pick up some VIP's baggage).

• Someone tries to pressure ATC during an SVFR delay by namedropping.

• An instructor pilot or rated senior officer cowboys low level at VNE in an unauthorized area.

If we, as either instructors or high level staff officers (rated or nonrated), have no regard for regulations and just good old common sense, how can we expect to impress their importance upon the new guys? Let's go a little further and say that each time we violate a regulation or encourage someone else to violate a regulation, we drive another nail in some young aviator's coffin. A possible cure for this unconcern would be to require the offender, regardless of position or rank, to be confined to a room alone for 1 hour and listen to ATC tapes of aviators in trouble.

CW3 Carl L. Hess
HHC, 55th Avn Bn (Cbt)
Ft. Hood, Tex. 76544

"Strike it rich—read the AVIATION DIGEST"

Sir:

With the closing of the fixed wing initial entry program and, I am sure, subsequent transfer of some eighty T-41 aircraft from Ft. Stewart, Ga., how about answering some frequently asked questions. 1. What causes the omni receiver [ARC-515R] to shut down when the radio [ARC-54 or BEI-901C (VHF-AM)] is keyed? 2. What needs to be done to correct this condition? 3. What would have to be done to get this aircraft certified for IFR use? 4. At what cost? 5. Are there any plans in the making to publish applicable dash 10, 20 and 35 manuals for the T-41, more or less accept it formally into the Army inventory of aircraft?

As far as the conversion to IFR use goes, I ask you to take a poll of the number of missions that were scrubbed due to weather. I am sure this poll will not sway any decision for conversion, but I believe it would be an interesting topic for discussion.

CPT Philip A. Mooney
U. S. Army TC Bn (Aircraft Maintenance Depot) (Seaborne) (Training)
Corpus Christi, Tex. 78419

• *Your letter was forwarded to the Systems Engineering Branch at the U. S. Army Aviation Systems Command at St. Louis, Mo. Here is their reply:*

Question No. 1: What causes the omni receiver to shut down when the radio is keyed?

Answer: The radio is a combination communication-navigation set (ARC type 515R) which has an internal relay that interrupts receiver functions during voice transmission. The relay is energized every time the transmitter is keyed.

Question No. 2: What needs to be done to correct this condition?

Answer: Nothing should be done to correct this. The relay itself is a correction to eliminate transmission feedback into the receiver.

Question No. 3: What would have to be done to get this aircraft certified for IFR use?

Answer: The T-41 is presently certified by the Federal Aviation Administration (FAA) for IFR use. However, the present onboard equipment is the very minimum required to perform an IFR flight. In the event of any component failure the pilot could be in serious trouble. A complete avionics complement which would give more confidence for full IFR operation would consist of dual full channel communication transmitter-receivers, dual VOR navigation equipment and single glide slope receiver, marker beacon receiver

Continued on next page

Continued from page 27

VIEWS FROM READERS

and ADF. In addition, a very necessary requirement, and one which is already being implemented in some T-41 aircraft, is an air traffic control (ATC) transponder. The FAA has ruled that all aircraft operating in CONUS airports have onboard an ATC transponder/automatic reporting altimeter combination in certain congested traffic areas.

Question No. 4: At what cost?

Answer: A study was made and a prototype aircraft was built 3 years ago which incorporated the additional equipment named above in a T-41 aircraft. The cost using commercial off-the-shelf equipment came to about $5,000 per aircraft. The cost now, using similar commercial equipment, would be more and if military qualified equipment were used the cost would be even more.

Question No. 5: Are there any plans to publish dash 10, etc., manuals?

Answer: There are no plans to publish any manuals for the T-41 based on DA decision at time of procurement since commercial support manuals would be used for the life of the aircraft.

We did not take any polls as to number of missions scrubbed versus weather conditions. This seems more applicable to someone locally located who has the figures available.

Sir:

Having read the July '71 issue of ARMY AVIATION DIGEST, your article on "Reserve Component Aviation" really charted a new course for me which was 180 degrees from what I had decided to do after I ETS. Needless to say, I was enthralled when I realized I was a part of your program.

Please forward to me info concerning Army Reserve and National Guard aviation units in Texas and Oklahoma. My future plans include schooling in both states.

Congratulations on putting out some "poop" which for me at least is timely and beneficial. Thank you.

CPT Larry E. Craven
304A Merrill Lane
Ft. Benning, Ga. 30915

• The information you requested is being forwarded.

Sir:

Reference your Fog Dissipation Questionnaire in the June issue of the DIGEST, a means for clearing supercooled fog from an area 1 kilometer long and 100 meters wide is being looked at by the Army's Combat Developments Command (CDC) headquarters at Ft. Belvoir, Va.

The system CDC envisions for Army airfields located above 40 degrees north latitude would dispense propane into the atmosphere as an aerosol.

Supercooled fog is composed of droplets of water suspended in air at 32 degrees or below which can be triggered and released by the propane spray.

The tank, valves and nozzles for the propane dispenser would be truck-mounted but CDC's requirements writers also recommend it be man-portable and capable of being air-dropped and operated from an Army aircraft.

Jim Milo
Fort Belvoir
Virginia 22060

INSTRUMENT CORNER

Q. Does an aviator, while flying on an IFR flight plan and in radar contact, have to report reaching a holding fix?

A. No, when in radar contact it is not necessary to report the time and altitude reaching a holding fix or point to which cleared. Reference: FLIP, section II, page 67, paragraph III, 1, 3a (1), dated 1 April 71.

Q. During a radar vector to the final approach course the pilot notices that he is passing through the final approach course. He has not been advised by the controller that he is being vectored through the final approach course or cleared for an approach. Should the pilot turn and proceed inbound on the final approach course?

A. No, aircraft will normally be informed when it is necessary to be vectored through the final approach course for spacing or other reasons. In the event the controller is unable to so inform the aircraft, the pilot is not expected to turn inbound on the final approach course unless approach clearance has been issued. Reference: AIRMAN's INFORMATION MANUAL, part 1, page 1-59, APPROACH CONTROL, paragraph 1.a. (1), dated May 71. TERMINAL AIR TRAFFIC CONTROL 7110.8B, page 156, paragraph 1353, dated 1 April 71.

Q. Is a pilot required to read back all ATC clearances?

A. No, there is no requirement that an ATC clearance be read back as an unsolicited or spontaneous action. Controllers may request that a clearance be read back whenever the complexity of the clearance or any other factors indicate a need. The pilot should read back the clearance if he feels the need for confirmation. He is also expected to request that the clearance be repeated or clarified if he does not understand it. Reference: AIRMAN's INFORMATION MANUAL, dated May 71, page 1-43.

CRASH FACTS

The crash facts system does work, but it requires the help of everyone if the best results are to be obtained. The many benefits to be realized cannot be denied and are worthy of the effort required for total success

Lawrence L. Bishop
Systems Engineering Directorate
U. S. Army Aviation Systems Command

IT HAS LONG BEEN recognized that documentation and studies concerning the circumstances leading to an unfortunate event may result in methods and techniques to preclude the recurrence of similar circumstances and resulting events in the future. Crash facts messages (CFMs) are a means of such documentation that allow for reporting significant data in a predetermined format regarding flight aborts.

According to AR 385-40, every flight that results in a flight abort is to be reported within 8 hours after the event. The term "flight abort" is used in discussing crash facts messages inasmuch as all events reported in a crash facts message cannot be considered "crashes" in the classical sense; i.e., some flights are aborted due to a warning signal or suspected mechanical deficiency but no damage is incurred and there are no injuries. In fact, a majority of the messages are of this type and are referred to as precautionary landings. An analysis of CFMs can frequently provide the type of information required to preclude unfortunate events such as flight aborts, some of which are more serious than precautionary landings.

Crash facts messages do not always contain the type of information desired for a thorough analysis, but this is to be expected. Frequently important facts regarding a flight abort are not immediately known and in some cases these facts become known only after a detailed investigation by engineers and other technical experts. Generally there is sufficient information reported in a crash facts message to enable a preliminary analysis. These preliminary analyses can be used to alert responsible personnel of suspected problem areas and possible contributing factors. Once alerted, other actions are necessary to resolve the problems, some which are discussed in the following paragraphs.

CFMs have been used by many organizations within the U. S. Army Aviation Systems Command (USAAVSCOM) for identifying problems that precipitated flight aborts. Success of the overall effort has been limited somewhat because of the large number of messages received, the number of errors and omissions found in them, and the resources available. In March 1970 a study of the crash facts system was completed and it was concluded that:

- CFMs frequently contained significant facts that could be used in resolving the problems that precipitated the flight aborts.
- The data would be more beneficial if it could be grouped, arranged and presented in a manner to facilitate analyses.
- An engineering judgment as to what was suspected as causing the flight abort would allow for more concentration on the

deficiencies of the aircraft systems.

- Automated methods would have to be employed to handle the large volume and diverse arrangements of facts.
- A scheduled report that could be easily understood without need for supporting documents or reading devices would be the best method of presenting the information and would allow for trend analyses.
- Each report should be limited to crash facts information for one type, model and series (TMS) fleet (UH-1D is a distinct TMS fleet as is the UH-1H).

As a result of these findings, a decision was made to automate the crash facts system. Rather than present tables of statistical tabulations derived from the automated crash facts system, the next few paragraphs briefly describe how the system operates, some significant observations and how the crash facts system is interrelated with other field reporting systems.

CFMs for the entire Army inventory are received in the RAMMIT (reliability and maintainability management improvement techniques) Project Office directly from the USAAVSCOM's communication center twice daily. These messages are reviewed by an engineer to determine the suspected cause that precipitated the flight abort. Data from each message is then transcribed to worksheets, keypunched and then placed on magnetic tape for computer operations. The data extracted from the messages after the engineering review are:

- Date of the accident.
- Message number.
- Aircraft type, model and series.
- Aircraft serial number.
- Location of the owning organization.
- Accident category (forced landing, incident, major accident, etc.).
- Accident cause (engineering judgment of suspected cause).
- EIR control number.
- Number injured.
- Number not injured.
- Brief remarks (engineering comments).

Since some messages are incomplete and/or have errors in the data, all are edited. Errors and omissions present special problems that could be reduced or eliminated if more emphasis were placed on the quality of crash facts reporting. The need for improvement in reporting cannot be overemphasized.

Some TMS fleets receive significantly more messages than others. Statistical groupings for only a few messages do not usually indicate the significant facts desired for analyses. Consequently, a report is scheduled for each TMS fleet according to the number of messages normally received. Many fleets have a monthly report whereas some have a quarterly and even a few have a semiannual report.

The report which presents the crash facts data in various arrangements is entitled "The Monthly Aircraft Crash Messages Summary." There are some features of this report as well as all RAMMIT scheduled reports which are worthy of noting:

- They are completely automated.
- They are in a technical report format with appropriate narrative and require no supporting documents or reading devices.
- The scope, limitations, methods, calculations, etc., are completely described so that the reader knows what is presented in the contents of the report.
- The methods used for calculating values and validation techniques are standard for all fleets thus allowing for true comparative evaluations.
- The characteristics of the aircraft systems are presented in many different perspectives (fleet, area, production year, etc.) thus allowing for a realistic assessment of the aircraft systems and influencing variables.
- Trend information is presented when applicable.
- The report is organized in a system, subsystem, format from part level to end item level when applicable.

To allow the data to be reviewed from different perspectives, "The Monthly Aircraft Crash Messages Summary" reports present six different listings with appropriate tabulations:

- A listing of all the data recorded for each crash message during the month in aircraft serial number order.
- A listing of the messages sorted according to location. For each location the messages are further sorted according to the cause of the flight abort. Tabulations are made for each cause within a location and all causes for each location.
- A listing of the messages sorted according to the aircraft contractual production year. For each production year the messages are further sorted according to the causes of the flight abort. Tabulations are made for each cause within a production year and all causes for each production year.
- A listing of the messages sorted according to the accident category (forced landing, precautionary landing, incident, etc.). For each accident category the messages are further sorted according to the cause of the flight abort. Tabulations are made for each cause within an accident

category and all causes for each accident category.

• A listing of the messages sorted according to the accident cause. For each accident cause the messages are further sorted according to the location of the aircraft owner. Tabulations are made for each location within an accident cause grouping and all locations for each accident cause.

• A listing of the messages sorted so as to obtain those messages that reported injuries. These messages are then sorted according to the cause of the accident. Tabulations are made for each accident cause grouping and all accident causes.

The types of analyses that can be performed as a result of these arrangements of data with the appropriate tabulations are too numerous to identify in this report. However, be assured that thorough analyses are being performed. To highlight just a few of the findings of a recent study, a number of graphs and tables are presented. The data presented is for UH-1D flight aborts (excluding combat/battle damage) reported via CFMs as occurring during July, August and September 1970. This study was further limited to only operational UH-1D aircraft from CONUS, Germany, Korea, Republic of Vietnam, Japan and Hawaii. Nonoperational aircraft excluded from the study consisted of those in bailment, transit, storage and maintenance. The operational aircraft excluded were those owned by activities with only a few aircraft or with extremely small flying hour programs.

Figure 1 displays both the number and percentage of total flight aborts for the six major accident categories reported. There was a total of 129 CFMs received during the quarter for the above mentioned geographical areas.

From the information used to compile figure 1, it was observed that during the quarter ending 30 September 1970 the more serious type of flight aborts decreased at a faster rate than precautionary

Figure 1

Major Categories Of Reported Flight Aborts

Category	Number of Reports	Percent of Total Reports
Precautionary landing	80	62.0
Incident	22	17.1
Forced landing	13	10.1
Major accident	10	7.7
Minor accident	3	2.3
Total loss	1	0.8
TOTALS	129	100.0

landings as shown in figure 2.

Since each CFM identifies the aircraft by serial number, it is possible to determine additional information regarding the specific aircraft and any other aircraft in the Army inventory through the aircraft flying time programs. The information for this program is reported via DA Form 1352 and includes such data as hours flown, operational readiness, landings, downtime, etc., for each aircraft in the inventory. This type of information is extremely valuable in studies as is evident in figures 3 through 9.

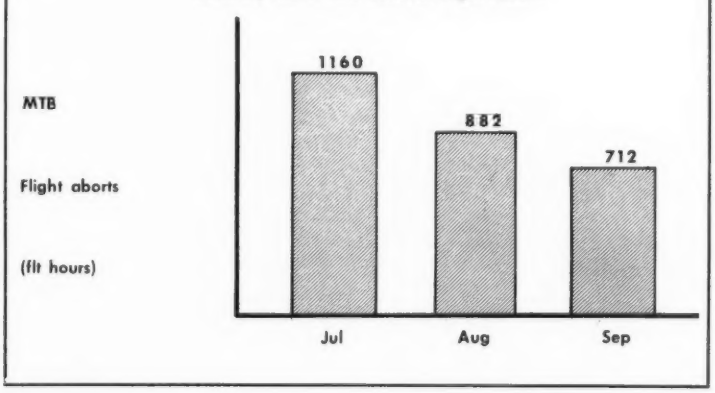
Displayed both numerically and graphically in figure 3 are the total flight hours and mean time in flight hours between (MTB) flight aborts for each of the six Army areas.

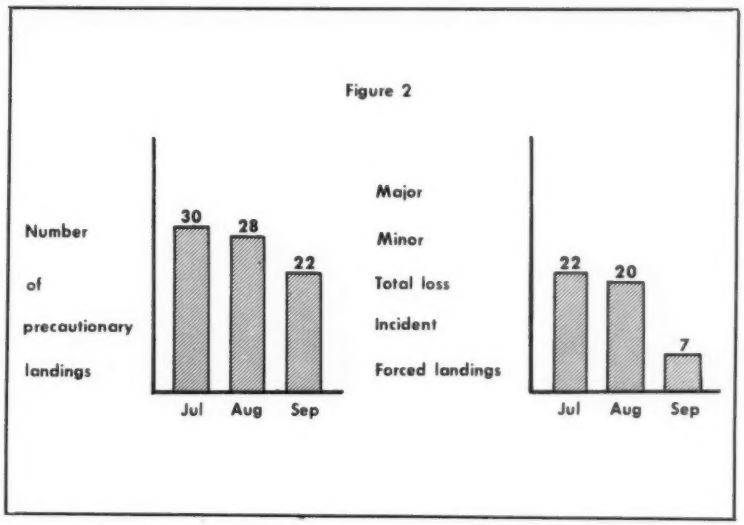
Aircraft M
For Quar

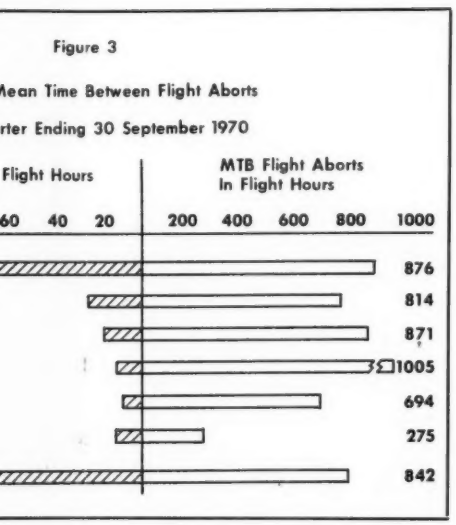
	(x10³)	80
CONUS	72,719	
Vietnam	17,099	
Germany	11,331	
Korea	8,041	
Japan	1,388	
Hawaii	550	
Fleet	111,118	

Figure 4

Germany Mean Time Between Flight Aborts







MTB flight aborts=

$$\frac{\text{Accrued Flight Hours}}{\text{Number of Flight Aborts}}$$

The mean time between values are measures of the frequencies with which the aircraft owned by the areas experience flight aborts.

From figure 3 it is observed that Hawaii has the highest frequency of flight aborts and Japan is second. These rates are, however, influenced by the small number of aircraft in each area. Korea has the best record of flight aborts with an average of 1,005 flight hours between aborts during 8,041 hours of flight experience during the quarter. CONUS accounted for the great-

Figure 5

Major Causes Of Reported Flight Aborts

Cause	Number of Flight Aborts	Percent of Total Flight Aborts
Warning light	33	25.6
Other	30	23.3
Hydraulic system	16	12.4
Engine	15	11.6
Struck object	10	7.7
Pilot error	9	7.0
Control system	7	5.4
Tail rotor	5	3.9
Maintenance error	4	3.1
TOTALS	129	100.0

est number of total flight aborts (83, which is 64.3 percent of all flight aborts) and has the second lowest frequency of flight aborts (876 flight hours between flight aborts).

The Germany frequency of flight aborts (712 MTB) at the end of the quarter was worse than the fleet average (842 MTB) and the flight abort rate became considerably worse during the quarter as shown by figure 4.

Figure 5 displays the various aircraft systems and components and other areas suspected of contributing to flight aborts during the quarter.

Based on the information utilized to compile figure 5, the following observations were made:

- There was a decrease in flight aborts at the end of the quarter due to hydraulic system failure as shown by figure 6.

- Over 11 percent of all flight aborts during the quarter were attributed to failures of the powerplant system. The powerplant system percentage contribution decreased at the end of the quarter as shown by figure 7.

- The number of injuries (and related causes and locations) reported during the quarter are displayed in figure 8.

Two injuries in RVN and one at Ft. Rucker, Ala., were reported during July as a result of two crashes. Three injuries resulting from one minor accident were reported from RVN during August. No injuries were reported during September.

The information in figure 9 is presented so that comparisons between average flight durations and frequency of flight aborts can be made for the various

Figure 6

Percentage Of Flight Aborts Attributed To Hydraulic Failures

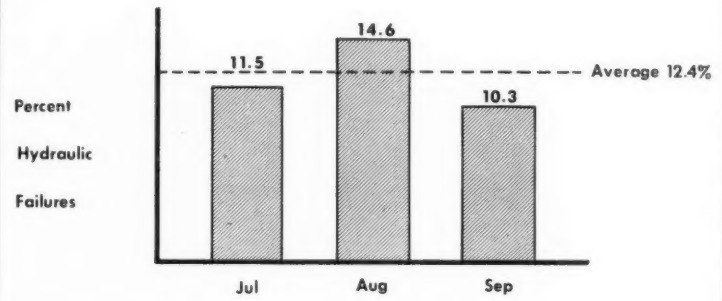


Figure 7

Percentage Of Flight Aborts Attributed To Powerplant Failures

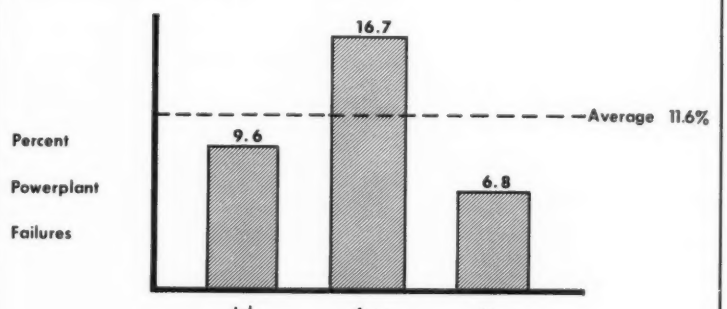


Figure 8

Locations And Causes Of Flight Aborts Resulting In Injuries

Cause	Number Injured	Location
Two aircraft meshed main rotor blades	3	RVN
Unknown - crash and burn	2	RVN
Suspected engine failure	1	Ft. Rucker

Figure 9

Summary Of Flight Abort Frequencies, Flight Durations And Flight Success Percentages

	Location Areas						
	CONUS	RVN	Germany	Korea	Japan	Hawaii	Fleet (Total)
Number of flights	258,751	51,368	26,277	26,653	4,696	2,423	370,168
Flight duration (minutes)	16.86	19.97	25.87	18.10	17.73	13.62	18.01
Number of flight aborts	83	21	13	8	2	2	129
Flight success percentage (%)	99.9679	99.9591	99.9505	99.9700	99.9574	99.9175	99.9651
Accrued flight hours	72,719	17,099	11,331	8,041	1,388	550	111,118
Mean time between flight aborts (flt hrs)	876	814	871	1,005	694	275	861

geographical locations. Values for mean time between flight aborts (previously presented) are also listed to aid in establishing possible correlations.

NUMBER OF FLIGHTS = Number of landings reported via DA Form 1352

ACCRUED FLIGHT HOURS = Total flight hours reported via DA Form 1352

FLIGHT DURATION (minutes)

$$= \frac{\text{(ACCRUED FLIGHT HOURS) x (60)}}{\text{NUMBER OF FLIGHTS}}$$

FLIGHT SUCCESS PERCENTAGE (%)

$$= \frac{\text{NUMBER OF FLIGHT ABORTS x 100}}{\text{NUMBER OF FLIGHTS}}$$

This study as well as other studies indicate that there is no correlation between the average flight duration and the frequency of flight aborts. Also, no correlation could be made between the total number of hours or flights flown during a period and the number of flight aborts for the period. This indicates that the flight abort rate is influenced to a large extent by pilot technique, types of missions and/or the environment in which the aircraft is operating.

The flight success percentage is a significant value and can be empirically used in estimating future success percentages. The flight success percentage for the fleet was 99.9651 which can be read as follows:

Based on flight aborts reported per CFMs for the quarter ending 30 September 1970, aircraft of the UH-1D fleet will successfully complete an average of 999,651 out of 1,000,000 flights of 18.0 minutes duration. The 349 flight aborts out of the 1,000,000 attempts would be categorized as:

- 62.0 percent precautionary landings.
- 17.1 percent incidents.
- 10.1 percent forced landings.
- 7.7 percent major accidents.
- 2.3 percent minor accidents.
- 0.8 percent total loss.

The objectives are sound, the approach has been defined and the crash facts system is working. However, the support of all responsible personnel is necessary, but the benefits to be gained cannot be denied and are worthy of the efforts required for total success.

COMMANDER

AVIATOR

FLIGHT SURGEON

AVIATION SAFETY OFFICER

CREW CHIEF

MECHANIC

Find yourself in one of the following classifications and learn . . .

WHAT YOU CAN DO FOR AVIATION ACCIDENT PREVENTION

COMMANDER: You, sir, have an awesome responsibility—that of assuring the safety of all personnel and equipment under your command. This responsibility is yours whether you're aviation rated or not. To succeed, you must have a complete knowledge of the capabilities of your personnel and equipment. Only with this knowledge can you be sure these capabilities will not be exceeded. Accident files contain many instances of junior grade and warrant officers flying into accidents because someone of higher rank wanted to travel or wanted some particular task accomplished under circumstances beyond their capabilities. Young aviators are known to waive judgment and attempt to exceed their limitations or the limitations of their aircraft when this occurs.

You can provide clearly defined policies and objectives for accident prevention. By your attitude, interest and example, you can generate the enthusiastic professional approach to flying necessary to achieve your objectives.

You can assure that training does not end for your aviation personnel simply because they have graduated from flying or other schools and been rated or awarded aviation occupation specialties. Schools can only provide instructions in the fundamentals of skills and sufficient practice to provide a sound basis on which further training and experience can build greater proficiency. This training and experience *must* be provided at unit level.

To further complicate your task, it is a proven fact that no commander has the time to personally plan, implement and carry out a full-time accident prevention program. You must delegate certain authority to staff officers and supervisory personnel within your command. Many accidents are the result of inadequate direction and control in this chain of command. When such accidents occur, they indicate operational weaknesses which require corrective action in the selection, training and supervision of those to whom command authority is delegated.

If you're a new commander, you're going to find that you will not always be operating under ideal conditions. Your personnel may not have the training or experience needed. Climatic conditions and terrain may present serious problems. Budgetary restrictions may delay completion of required facilities. To help cope with these and other problems, you can establish a unit aviation

WHAT YOU CAN DO

accident prevention council. In addition to yourself, members of the council should include your aviation safety officer and the staff officers closely associated with operations, supply, maintenance, medicine and engineering. The council should have authority to develop and recommend positive courses of actions and it should function as a coordinated body. Properly motivated by you, this council can provide an effective means of increasing the awareness of your staff and supervisory personnel toward their accident prevention responsibilities.

You can continuously review your accident prevention program by assessing the following points:

Do all personnel know our prevention efforts are enthusiastically supported by me, that all activities receive my personal interest and that I closely monitor the results?

Do all members of the command understand that education, continuous training and close supervision are essential to our prevention efforts?

Was my aviation safety officer selected on the basis of experience, ability and education in the field of aviation safety? Does he report directly to

Commanders will not always be operating under ideal conditions. Climatic conditions and terrain may present serious problems. To help cope with these and other problems, a unit aviation accident prevention council can be established

me? Does he successfully accomplish assigned missions? Are his methods effective?

Do we have an effective system for exposing operational hazards? Are appropriate actions taken to eliminate hazards? Do all personnel understand and appreciate the advantages of hazard reports?

Are prevention council meetings regularly scheduled to discuss potential problem areas? Do the appropriate staff officers fully participate?

Do I review all aircraft accident reports personally to ensure adequacy of investigation, accurate findings and recommendations, and effective corrective actions?

Are regularly scheduled safety meetings conducted for crew members and maintenance personnel? Do all attendees participate freely in these meetings?

A study of 135 Army aviators who had two or more accidents during the 2½-year period from 1 January 1967 through 30 June 1969 revealed command/supervisory factors were directly involved in 55 of the 249 accidents studied.

It was also found that positive command actions could have prevented many of the initial and repeat accidents. For example, in accidents involving crew errors, instructor pilot or aircraft commander orders were revoked in only two cases after first accidents; in six cases after second accidents; and in one case after a third accident. Only four flight evaluation board actions were noted in the reports. Additional training was noted in only two cases after second accidents.

Based on the findings, conclusions and recommendations of this study, the following 10 points were developed. Command attention to these points will help to prevent accidents, particularly the repeaters, in all units.

1. Remember that *any* aviator, under the proper combination of stressful circumstances, may commit errors leading to an aircraft accident. There is no pilot error "type." The safety-minded commander will be alert to changes in the behavior of his aviators as they react to the stresses of flying.

2. Be firm with aviators whose accidents were caused by pure carelessness, inattention or willful misbehavior. Experience has shown that only positive corrective actions will prevent them from repeating.

3. Closely supervise aviators who have just had pilot error accidents. This study revealed that more than 20 percent of these have their second accident within 60 days of their first one.

4. Be very selective in appointing aviators with less than 150-200 hours pilot time since graduation from flight school as instructor pilots. Exercise extreme care in reinstating IP and AC orders once they have been revoked.

5. Carefully guide those pilots who are eager to excel, to succeed, and to accomplish missions at any cost. These can be desirable qualities, but, without proper guidance, this type of eagerness can adversely affect aviator's judgment. It is also wise to question your own attitude in this regard.

6. Supervise aviators with one or more incidents caused by pilot error as closely as if they had been accidents. The difference between an

WHAT YOU CAN DO

incident and a STRIKE is often measured in inches or seconds. The mistakes involved are often identical.

7. Carefully evaluate and supervise aviators who have had personal error accidents, but will not admit to themselves or others that the fault was their own. Since they do not blame themselves, they do not learn a lesson and will continue in their erroneous ways.

8. If an aviator's accident is suspected of involving lack of experience, proficiency or currency, he will very likely repeat it if faced with the same situation without being given additional guidance, training and practice.

9. Be alert to the opinions of each pilot's ability, as expressed by fellow pilots. When one aviator says of another, "He is an accident waiting to happen," it is usually correct.

10. Examine your own aviation accident prevention program. Twenty-two percent of the accidents in this study involved some form of supervisory error as a contributing factor.

AVIATION SAFETY OFFICER: An experienced and successful aviation safety officer (ASO) will tell you he must wear many hats for a great variety of tasks, from the twin billed plaid of Sherlock Holmes to the tasseled mortarboard of a professional educator. He is his commander's right arm when it comes to all matters pertaining to accident prevention. The strength or weakness of that arm is determined to a large extent by the ASO's performance.

The prerequisites, functions and responsibilities of a successful ASO have perhaps been best described by Mr. Norman L. Horton, lecturer, Institute of Aerospace Management, University of Southern California. Mr. Horton wrote: ". . . United Air Lines has a working motto: 'Any job professionally done is inherently safe.' Think about that for a moment and you will see that if you are 100 percent successful in organization, professionalism and pride, your unit will not require the full-time services of an ASO because you have eliminated most of his job and your accident rate will approach zero.

"But we do have accidents. Why? One good reason is that so much collective human effort is put in the manufacture and operation of today's complicated and sophisticated aircraft, that positive inspection, quality control and supervision throughout this process is not economically reasonable. Therefore, something *will* fail somewhere, sometime.

"It has been said, 'Every accident, no matter

The aviation safety officer is his commander's right arm when it comes to all matters pertaining to accident prevention. The strength or weakness of that arm is determined by the ASO's performance

how minor, is a failure of organization.' This may be hard to accept, but a little thinking on the subject will prove its validity. No matter what kind of an accident you can recall, someone, somewhere made a mistake which allowed that accident to happen.

"One of the primary missions of organization is to eliminate mistakes. Therefore, a proper organization, a perfect organization, will not tolerate human errors of omission or commission. But, being human, we *do* make mistakes. Thus, the Army has ASOs and we must define this job. Unfortunately, this man has a lot to do—more than one man should normally be required to accomplish. His sole duty is to ensure the commander that his assigned missions are professionally accomplished and, if not, where corrective action must be concentrated.

"Stop a minute and consider your own organization. Then go back and review the mission, the duty, the sole duty of the ASO. Would it keep him busy? Decidedly. Probably 26 hours a day, 8 days a week! Immediately, two more questions come to mind: Where should this billet fit into your organization and what kind of man is required to fill this billet? Let's look more specifically at a few of the duties of the ASO:

"Maintain intercommand liaison to implement aviation safety programs.

"Coordinate safety aspects of operations involving aircraft ground handling and assisting in resolving related safety problems.

"Observe flight and ground operations of aircraft to detect and correct unsafe practices.

"Advise and assist aircraft accident investigation boards.

"Review reports of aircraft accidents and initiate corrective action when required.

"Establish and maintain an effective preaccident plan, as outlined in DA Pamphlet 95-5.

"Conduct surveys of facilities to ensure that communications equipment, navigational aids, and other electronic aids to aircraft operation meet designed operational requirements.

WHAT YOU CAN DO

"Inspect physical status of airfields for conditions affecting safety and recommend improvements pertaining to airfield lighting, runways, taxiway requirements and other facilities.

"Disseminate pertinent flight safety literature and develop programs to promote its reading and understanding by responsible personnel.

"Maintain adequate files of aviation safety material and instruction for ready reference.

"Maintain organizational aircraft accident records and statistics.

"Review aviator flight records and unit training program to ensure that training is designed and carried out to overcome deficiencies.

"Two more duties are added to this list by DA Pam 95-9:

"Occasionally ride as a check pilot with air crews to determine standardization and safety practices among aircraft teams.

"Monitor techniques and proficiency of air crews in handling weapons and ammunition.

"The mere carrying out of any one of these duties may keep a man fairly busy in a large organization.

"Ten weeks of training at the Army Aviation Safety Officers Course at USC will certainly help an ASO accomplish his mission and ease the burden of his duties. But ASOs cannot be manufactured. When students come to USC they must arrive with certain prerequisites. To become proficient as an ASO, each student must have:

"*Avid curiosity* about all phases of aviation, maintenance, training, personnel, operations, ordnance and all subjects as they pertain to his organization.

"An *analytical mind* so that he may visualize possibilities and correlate evidence pertinent to his field.

"*Infinite patience.* This in itself is a short definition of genius.

"*Perseverance.* He must carry through to logical solutions, regardless of roadblocks, administrative or otherwise.

"*Tact and diplomacy.* He must inspire confidence and respect from those with whom he deals, both senior and junior. In this sense he, too, must be a real professional.

"*Absolute integrity.* He must be above influence from any source, especially himself and his own preconceived notions. He must never resort to conjecture or guesswork.

"*Sound judgment.* Once all the above have been accomplished, he must be able to judge the results and weigh each conclusion.

"*Experience,* for which there is no substitute. Now, this includes experience in aviation. He must be a good, experienced and, preferably, mature pilot. Mature does not necessarily mean chronologically old. Rather, he must be able to profit from his own experience and that of others. Here again, there is an appropriate saying, 'You must be able to profit from the mistakes of others. . . . You can't possibly live long enough to make them all yourself.'

"*Communications skill.* He begins with a real desire to learn and follows through with effective and timely sharing of his experience with others.

"Is that all that is required of an ASO? No. In addition to the above characteristics, he must have certain talents:

"He must be a good pilot, an exceptional pilot if possible.

"He must be a diplomat and psychologist.

"He must be a metallurgist. He must be able to talk about fatigue, stress, etc.

"He must be a structural engineer, since he must be able to reassemble the aircraft after a crash.

"He must be an aeronautical engineer. Why? Because he must be able to understand the aerodynamic forces that were acting on the aircraft at all times.

"He must be a pretty good chemist, since he has to deal with chemical laboratories and talk their language about the oil, fuel, hydraulic fluid and alcohol samples that must be analyzed.

"He should be a pretty good mechanic because he must be able to understand why engines run and why they might not run. All he may have is the evidence of a smashed engine after the crash.

"He must be a pretty good electrician. He has to be able to determine whether or not the fire was caused electrically or by other means. He must be able to trace all circuits of the aircraft after a crash and determine whether or not they were carrying current prior to the crash.

"He must be a pretty good electronics man since he must be able to understand radio, the navigational and engine instruments, so he can tell whether or not they may have contributed to the crash.

"He must be a pathologist since he must talk to flight surgeons in their vocabulary. He must be able to understand post mortem analysis and the human factor causes in aircraft accidents.

"At this point you may say this cannot possibly be done . . . no one man can acquire in one lifetime all of the above talents and operate them efficiently. You're right, but a good ASO must be

able to speak the languages of the specialists listed above. He must be able to call on expert advice. He must be able to recognize who is an expert. He must be able to use these experts and at the same time discriminate among them.

"Where does this man fit into an organization? The discussion of the duties of the ASO shows nothing less than command responsibility. Of course, *all* responsibility eventually settles on the shoulders of command. This mission is so vital to successful operation of units that the duties of safety should not be delegated too far down the line. Ideally, the ASO should be the direct extension of the eyes and ears of command and should have immediate and direct access thereto. Under some conditions, this may not be feasible. However, in any organization, command should strive to separate ASO duties from any other staff or operational function.

"Well, who is this superman—this CPT Thomas A. Edison, this MAJ Leonardo da Vinci, this LT Napoleon Bonaparte? Is he anyone special? Yes, he is. But then again, no. He is a commissioned or warrant officer of the United States Army! He could be you! . . ."

AVIATOR: You've heard it before, but it bears repeating—You can embrace a professional approach to flying. To qualify as a true professional, you must continue your study of aviation until retirement. And that's not enough—not by a long shot. Knowledge alone will not make you a professional. It must be combined with application. This is the step that demands hours, hours and more hours of practice to maintain the correct balance of knowledge and application. There are no shortcuts to this result.

It's your job to build and maintain proficiency in the aircraft you're assigned to fly. To do this, you must know the aircraft, their systems and related equipment. Professional aviators know their equipment. They know the limitations of their aircraft and skill. Neither false pride nor ambition will cause them to exceed these limitations.

It's your job to build and maintain sound physical and mental fitness. You can accomplish this by developing a daily regimen of exercise and insisting on a balanced nutritional diet. Daily exercise will not only get you fit and keep you fit now. It will pay dividends in the longevity of your professional aviation career. You wouldn't allow a piston engine aircraft to be refueled with JP4 and you should show no less concern with the fuel you use for your body. Any questions about exercise and diet should be directed to your flight surgeon or aviation medical officer. It is also vital to your health and performance that you take only the medications and drugs they prescribe.

Personal problems—financial, romantic, career or otherwise—must not be permitted on the flight line. You must develop the maturity to avoid, solve or dismiss such problems before you fly. Flying demands 100 percent of your attention. Anything less is unacceptable for professional performance. If you find yourself unable to devote your total attention to flying because of a personal problem, ask for help from your CO, flight surgeon, chaplain, etc., but don't fly until you can enter the cockpit with your full mental capacity directed to flying.

Another vital requirement for professional flying is the maintenance of strict air discipline with respect to regulations, rules and ethics. The following accident brief from a recent USABAAR Weekly Summary illustrates what happens when this requirement is not observed.

"The ship I was in was chalk one in the formation. As we flew back, a decision was made that two troop ships should break from the formation and follow the other five ships, allowing enough spacing so that all seven ships wouldn't be offloading troops at the same time. Our ship and the other troop ship then broke left, leaving the formation. We headed for the beach, for no reason except that flying along the beach is a little more scenic.

"The other ship was flying somewhat lower than ours. They gave us a call and said they had something on the ground they wanted to check out. Our aircraft commander told them we would cover them from above. We began circling the other ship and making gunruns. We were in a gunrun before we crashed. I could see, as did the aircraft commander, that we were much too steep. The aircraft commander tried to recover by coming back on the cyclic and flaring the ship. The flare, however, did little to slow our descent. Our air speed was rather high when we hit. I don't remember much except that my seat came out of the aircraft. I was on fire and I released my belt and got into a pond of water to put the fire out."

The foregoing was related by the pilot, the only crew survivor. The net results of this accident were seven fatalities, three serious injuries and one lost helicopter.

The flight surgeon summed it up this way: "An accomplished aircraft commander of an aircraft, on his last day of flying in Vietnam, allegedly with

WHAT YOU CAN DO

a loaded aircraft, wanted one last thrill before returning to CONUS. His handling of the aircraft indicates total irresponsibility and his actions resulted in multiple fatalities."

To further illustrate the magnitude of accidents resulting from violations of air discipline, a recent wire strike study (USABAAR Report No. 71-2) reported 146 wire strikes during the 3½-year period 1 January 1966 through 30 June 1970. These

Professional aviators know their equipment. They know the limitations of their aircraft and skill. Neither false pride nor ambition will cause them to exceed these limitations

wire strikes resulted in 75 fatalities, 56 injuries and an aircraft hardware loss of approximately $6.6 million. The preface of this report states: ". . . The report revealed that a high percentage of wire strike mishaps have occurred as a result of low level operations which were not required by the mission or dictated by weather conditions. In addition, the violation of regulations and/or unit SOPs concerning low level flight and the conduct of training in unfamiliar areas were major causes of wire strikes. These are the types of factors and causes, nonessential to missions, which contribute to wire strikes and which must be eliminated through command action. . . ."

In summary, you, as an Army aviator, can make a tremendous contribution to aviation accident prevention through a professional approach to flying which embodies knowledge, skill, sound physical and mental health and rigid adherence to strict air discipline.

FLIGHT SURGEON: Your job is to provide for the mental and physical well-being of aviators and other flight crew personnel. It's a full-time job—one that can't be accomplished racing storks or bandaging cuts in post hospitals. All too

The flight surgeon has a full-time job. Only through constant association and observation can he be sure the flight personnel of his unit receive adequate maintenance

often, medical officers trained to care for flight personnel are kept so busy with daily hospital routine that they're seldom seen until it's time for annual physicals. Only through constant association and observation can a flight surgeon be sure the flight personnel of his unit receive adequate maintenance.

Flight personnel are human beings with the common human trait of ignoring early symptoms of physical or mental malfunctions. Only the flight surgeon is trained and qualified to recognize such symptoms, with the responsibility of removing from flying status those with physiological or psychological hazards to flight. Early recognition results in early treatment and early treatment means less lost time and more efficient operations. We insist on daily and periodic inspections of aircraft and related equipment, but we often allow flight personnel to perform a full year without physical inspections.

In addition, AR 95-5 lists these duties for flight surgeons and aviation medical officers:

Maintain liaison within the command to implement the aviation medical program.

Participate in and observe flight operations to monitor physical stresses in flight which contribute to fatigue.

Serve as members of aircraft accident investigation and flight evaluation boards.

Responsibility for the adequacy of the medical portion of preaccident plans.

Monitor the social and personal habits of aviation personnel.

Maintain aviation medical records on flight personnel.

Monitor the survival and psychological training of aviation crew members.

Can anyone doubt this job requires the full-time service of flight surgeons and aviation medical officers?

CREW CHIEF/MECHANIC: Through training and experience, you have been equipped to maintain the aircraft of your unit. It is your normal responsibility to see that maintenance is performed as required by published and approved procedures. It is also your responsibility to eliminate all guesswork from the tasks you perform. As with aviators, you can only do this by taking a professional interest in your work. This means keeping abreast of all maintenance manuals, other maintenance publications and the techniques required for your aircraft.

If you are a good crew chief/mechanic, you'll go one step further. You'll see to it that your aircraft do not leave pads or chocks with dirty windows, loose articles, improperly inflated tires and struts or any similar hazards. You won't be satisfied with minimum requirements—you will insist on the nearest notch to perfection. To help you achieve this, you can adopt . . .

The Mechanic's Code

As a maintenance technician, I recognize my obligations:

To the United States Army, which trusts that I am technically qualified for the tasks expected of me.

It is the mechanic's responsibility to see that maintenance is performed as required by published and approved procedures. It's also his responsibility to eliminate all guesswork from the tasks he performs

To the air crews and passengers, who trust their lives and safety to my mechanical skills.

To my organization, who expects me to be a professional mechanic as well as a professional soldier.

To my fellow mechanics, who as team members must depend upon me for a task completed.

To myself for the personal satisfaction of a professional job well done.

To discharge these responsibilities:

I will perform maintenance of the highest quality to assure the safety of every flight.

I will always be sure of my work or when in doubt consult my supervisor.

I will strive to improve my professional skill by attention to duty and self-education.

I will not allow personal desires or consideration to affect performance of duty.

I will never attempt to perform duty when my mental or physical condition might lead to maintenance error.

I will keep my tools and equipment in first class condition to ensure a job worthy of the professional mechanic that I am.

I pledge adherence to these principles to reflect credit to myself, my fellow workers and my profession.

Note: If you don't find yourself in these classifications, watch for other classifications in coming issues.

AVIATION ACCIDENT PREVENTION FORUM

an interchange of ideas between readers and USABAAR on subjects of aviation accident prevention

THIS FORUM is designed to provide a sounding board for all Army aviation personnel to express their ideas, comments and recommendations on all matters pertaining to accident prevention. We reserve the right to edit submissions without changing their meaning. All letters must be signed, but names will be withheld on request. Our purpose is to exchange ideas and information for the benefit of all. Your contributions will be welcomed in the form of letters, cards, copies of Share-Its and Operational Hazard Reports, or what-have-you. Please address yours to:

Director
USABAAR
ATTN: E&P Department
Fort Rucker,
Alabama 36360

ASO's View

Your recent aviation accident prevention survey invited additional comments.

We have some.

First, we feel that the commander's attitude toward aviation safety is the strongest factor in the program. All the initial and subsequent training, posters, articles, etc., you can muster only supplement the commander's attitude.

Articles in the AVIATION DIGEST have done an excellent job of analyzing what that attitude should be. Obviously, every commander wants a no-accident record. He's seldom going to get it unless he puts the emphasis on professionalism. That means using the check list and flying by the rules and procedures. It means maintenance by-the-book. If we could get every aviator and mechanic just to do those two, the improvement would be enormous. God knows, there are things that can go wrong over which the aviator has no control. If he loads the odds in his favor by flying like a pro, he's got that much more time to deal with the imponderables when they arise.

You've been saying this and writing this until you're blue in the face. Until each commander takes up the chorus, we have only begun the struggle.

Our second point involves touchdown autorotations.

Some will argue that, statistically, a power-off emergency autorotation is rare and doesn't justify tearing up machines in the process of teaching kids how to make them. Statistics are not much help to the guy who experiences one and has never done anything but a power recovery. At that point, he'd be more than happy to trade places with any safety expert or computer who says it's unlikely to happen.

We think touchdowns should be continued under supervised conditions. The confidence level that can be attained is valuable insurance.

Thank you for this opportunity to express some opinions. We look forward to seeing the results of the survey and whatever changes they prompt.—MAJ, ASO.

Comment: For commanders' prevention advice, see page 37.

Practice Autorotations

Discussion about practice touchdown autorotations focuses on whether aviator proficiency and experience gained through practice touchdown autorota-

tions justifies manpower and monetary losses from this practice. It must be recognized that an autorotation is the only maneuver available to rotary wing pilots which can save the aircraft, crew and passengers during actual forced landings. Successful autorotations which have been made because of major component failure far outnumber mishaps involving damage which results from practice touchdown autorotation training. Unless practice touchdown autorotations are conducted in the field, aviator proficiency in this vital maneuver will be drastically reduced. This will result in a marked increase in unsuccessful autorotations and, conversely, more helicopter mishaps involving damage.

USABAAR supports practice touchdown autorotations conducted in the field, if the following requirements are observed:

1. Touchdown autorotations conducted only under the following conditions:

a. During formal courses of instruction at the U.S. Army Aviation School.

b. During formal transition flight training when authorized by the installation commander and with a qualified instructor pilot on board who is current and proficient in touchdown autorotations in the type, model and series of helicopter under consideration.

c. Conducted in units to satisfy basic pilot proficiency checkride requirements. The following restrictions will apply to proficiency training only:

(1) Be controlled at a battalion or higher level as an organized and closely supervised program. Practice touchdown autorotations in units less than battalion size where there is no higher aviation headquarters will be supervised by the approving installation commander.

(2) Be conducted only in a designated training location that has air-to-ground communications and crash/fire rescue facilities available and is free from obstructions. A feasible method is needed for establishing the "opening" and "closing" of practice autorotation areas. Reconnaissance of touchdown areas should be conducted to ensure surface is clear of obstacles and suitable for a ground run.

(3) Be conducted only in dual controlled helicopters with a qualified instructor pilot who is current and proficient in touchdown autorotations in the type, model and series of helicopter under consideration at one set of the controls.

2. Restriction of practice touchdown autorotations to straight-in approaches (practice hovering autorotations excepted). Practice autorotations of 90 degrees or greater will not be made to a touchdown.

3. Elimination of unanticipated surprise practice hovering autorotations, except for IP training.

4. Power recovery (VFR conditions) to other than an approved touchdown area will be initiated in sufficient time to ensure that descent will be terminated at a minimum of 100 feet above ground or highest obstruction within the practice area.

5. For simulated IFR conditions, power will be applied in sufficient time to complete final recovery no lower than 700 feet above ground level.

6. No passengers should be aboard aircraft during the conduct of touchdown autorotations.

7. No more than six practice touchdown autorotations will be performed during any one hour instructional period.

8. Aborted takeoffs and autorotations during climbout on takeoff prohibited, except:

a. When conducted during formal instruction and with a qualified instructor pilot who is current and proficient in touchdown autorotations in the type, model and series helicopter at one set of controls.

b. Actual emergencies.

9. Once an aviator or student is qualified, touchdown autorotations will be practiced only to the extent of maintaining proficiency. This practice will conform to 1c above.—USABAAR.

Readers are invited to participate in this forum. Send your ideas, comments and recommendations to USABAAR, Fort Rucker, Alabama 36360

Arnold R. Lambert

To maintain the flame retardant qualities and reliability of Nomex flight suits, only authorized materials will suffice

HOW ABOUT the loose belt loop, missing button, rip or pulled seam in your Nomex flight suit? Assuming you have a wife, girl friend or nearby Aunt Molly, chances are you've counted on her to make the necessary repairs. If so, forget it! These would be unauthorized repairs.

To maintain the flame retardant qualities and reliability of Nomex flight suits, only authorized materials will suffice. Though your favorite female may be as skillful with her sewing machine as you are with your flying machine, she can't get the Nomex thread, buttons or Nomex patch cloth because they're only authorized to be stocked by direct support maintenance. Also, she doesn't have the specifications that tell her what type of stitch to use, how many stitches per inch or the size of the patch to be used. These specifications go so far as to list the number of stitches to use for sewing on a button.

If, by chance, you may have seen Chapter 7 of Change 1 to TM 10-8400-201-23, it may have you confused. This chapter covers maintenance of your Nomex summer uniform and paragraph 7-6a on page 7-2 authorizes some organizational repairs. The materials needed to make these repairs are listed on page 7-6, but all of these materials have source, maintenance and recoverability (SMR) code "PF." This is where the confusion comes. The SMR code "PF" means these materials are stock items, but only at direct support maintenance level. The Mobility Equipment Command (MECOM) is currently preparing Change 2 to TM 10-8400-201-23 and this confusion will be eliminated. Don't be surprised if the authorization for organizational repair is deleted entirely. MECOM insists on machine sewing whenever possible.

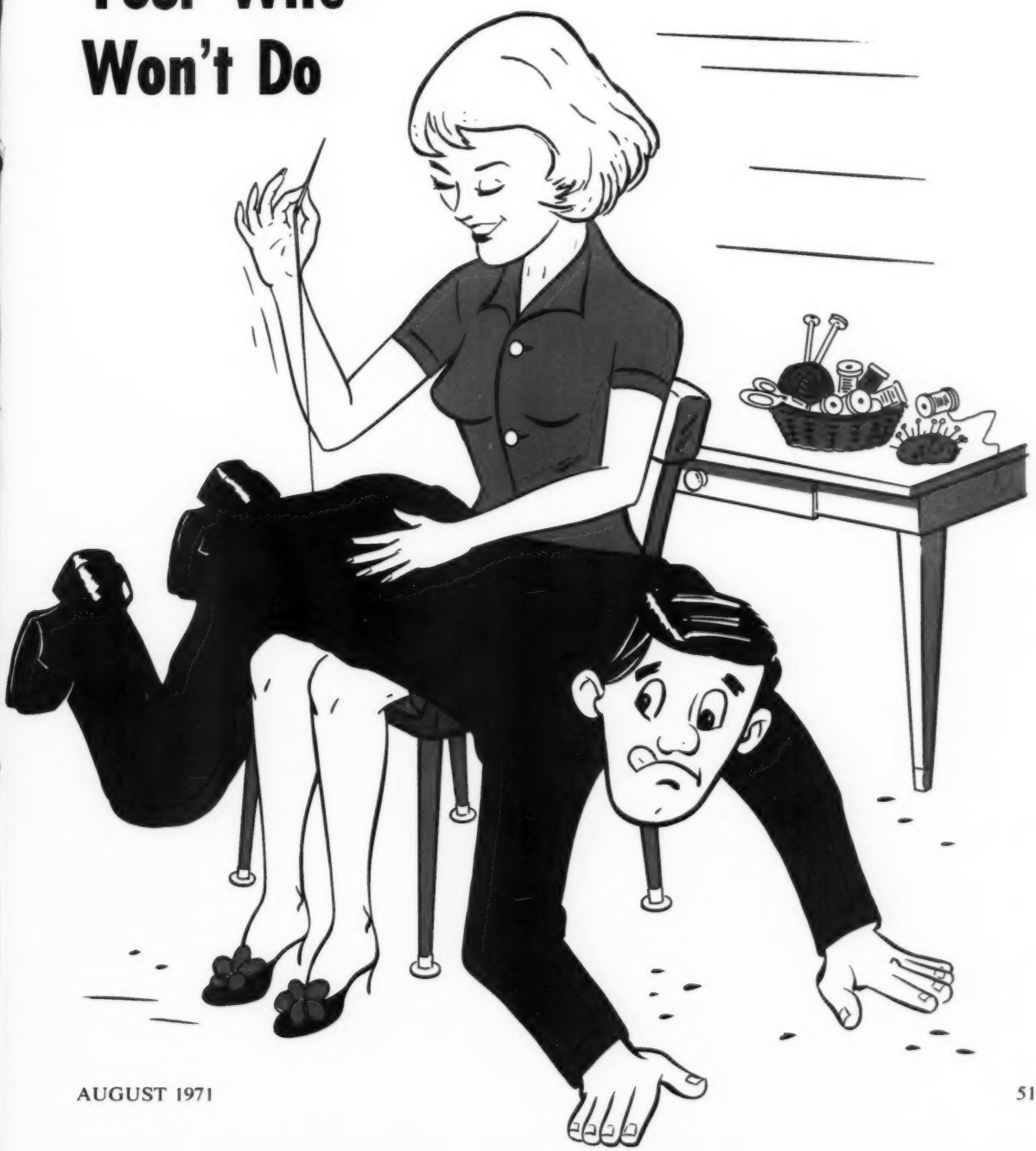
When Change 2 is published, it will be worth your time to take a close look at Chapter 7. After you read this, you'll probably want to explain to your wife how your Nomex suit should be laundered. If so, look out! You will probably get a more violent reaction than you did when you told her she wasn't authorized to repair it. Washing will have no adverse effect on the high temperature resistant quality of your Nomex if proper precautions are taken. Your wife will probably be happy to know that she should never starch Nomex [see "Starch and Nomex," April 1971 DIGEST] and she probably won't complain about the need for thorough rinsing. Inadequate rinsing or starch will impair the effectiveness of your Nomex suit. Your wife will make certain she takes these precautions because she wants you to have all the protection you can get. When she'll hit the ceiling is when you tell her that Nomex can be machine washed on the short cycle, but you want her to hand wash it. This will require a fast explanation on your part. Tell her the number of washings won't hurt the garments, but they will last a lot longer if hand washed.

You'll also find in Change 2 that more of the components of your Nomex flight suit are being made from Nomex materials, such as the hook and pile fastener tape used on short sleeves and trouser legs and the textile portion of slide fasteners (zippers). Change 2 will list these components with sizes and FSNs. Those of you who have submitted EIRs on Nomex suits may see the results in Change 2.

Coaches never start games by holding their first teams on the bench and sending in substitutes. They know they would be risking losing games. You should never substitute materials and skills in maintaining your Nomex flight suit. If you do, you risk much more than a losing game. Always send your Nomex to direct support maintenance for repairs. They don't use substitutes!

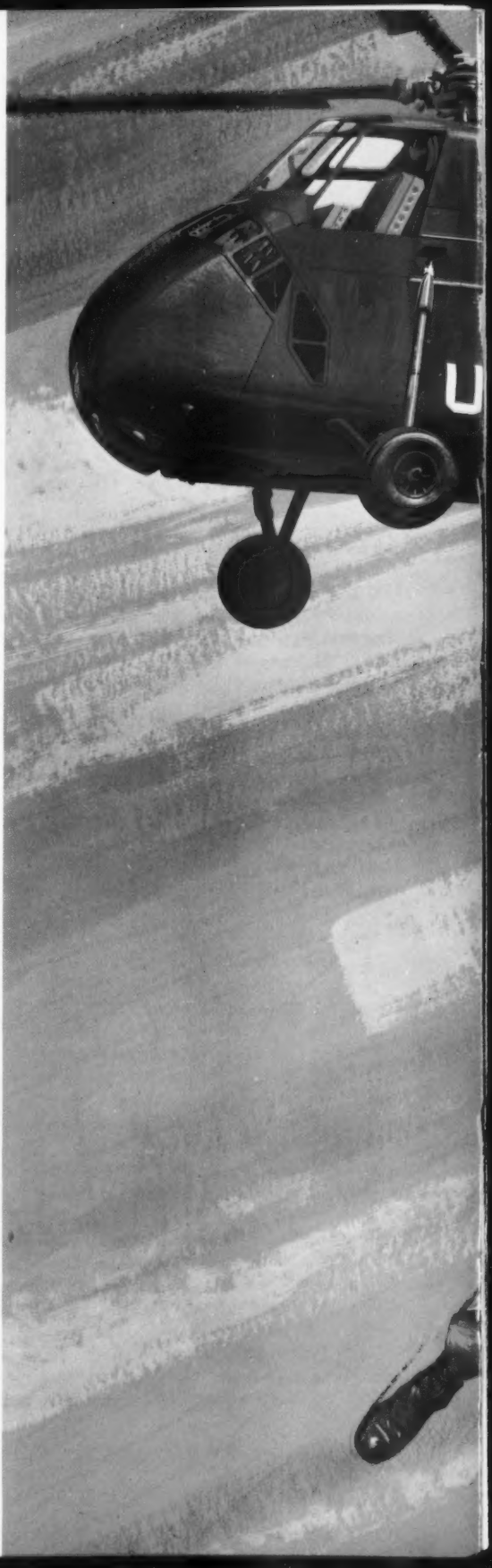
For Nomex repairs . . .

Your Wife Won't Do



CW4 Paul H. Johnson
Technical Research and Applications Department
USABAAR

Emergency Escape Systems For Helicopters



THE PROBLEM OF parachutes in helicopters has revealed itself many times in the past, without a satisfactory solution. What are your chances of successfully bailing out of a disabled helicopter? Ask the average pilot and he'll probably agree with the old party line: "Regardless of altitude, it is extremely doubtful that exiting personnel would be able to clear the rotor system of an uncontrolled helicopter. In the event the main rotor is damaged, the resultant violent and uncontrollable helicopter attitudes make successful parachute evacuation virtually impossible."

The trouble with statements like this is not only that they lack a factual basis, but they jeopardize the success of any future program by instilling fear instead of confidence. Actually, we are deal-

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DANGER

ing with a vicious circle. The very limited use of parachutes in helicopters has resulted in very few *saves*. In hangar discussions, this is interpreted as proof of the futility of parachutes in helicopters.

Instead of rehashing all case histories of attempted and successful helicopter bailouts, we will describe only the following four:

1. A helicopter test flight was being made to demonstrate its structural integrity at a gross weight of 10,200 pounds, in 1-g flight, up to a calibrated air speed of 167 knots. A level acceleration was started at 3,500 feet and the heading was stabilized to achieve an overwater run up a river. A shallow 4-degree dive was initiated to build up air speed to achieve the desired data point.

At approximately 170 knots and 2,000 feet, severe blade stall was encountered, followed by extreme roughness. Within a second or two, the rotor, rotor head and transmission were seen to separate intact from the helicopter. The fuselage plummeted to the water, hitting in a nose low, left roll attitude. The pilot evacuated shortly after separation of the rotor assembly and parachuted safely into the water. He was immediately rescued from the water by the chase helicopter. The rotor assembly hit the water after the pilot.

2. Another pilot had just completed a directional stability test when erratic pitch movements occurred, followed by a rapid and uncontrollable roll to the right. At this time, the pilot shouted, "Get out!" When the helicopter reached the approximate 90-degree point of the roll, the main rotor mast struck the stops and failed, allowing the rotor system to separate.

As the rotor left the helicopter, it struck the copilot and severed his right arm and leg. Blade strikes also started a fire in the under portion of the helicopter. It turned on its back and fell inverted to the ground. Both pilots made successful bailouts. However, the copilot died on the way to the hospital, as a result of injuries prior to bailout.

3. A Coast Guard pilot and mechanic bailed out of an HOS-1. The rotor head left the fuselage, probably due to a violent downdraft. The pilot had no difficulty in making his exit and parachuted safely. The mechanic did have difficulty leaving the helicopter. He finally dove through the plexiglass nose, sustaining minor cuts about the face, but landing safely. The pilot bailed out at approximately 3,500 feet and the mechanic at about 1,500 feet.

4. While on a hovering ceiling test, the nose of another helicopter pitched down to a vertical position. The pilot yelled to the engineer to get out as he—the pilot—rolled out the left window and made a normal parachute descent. The engineer apparently started to exit at the same time, but was unable to clear the helicopter until too late for his parachute to open.

Let's take a pilot-oriented look at helicopter capabilities. This pilot has been told all along through flight training: "Helicopter design, flight characteristics and autorotation qualities virtually eliminate the necessity for bailout." The average helicopter pilot is in full agreement with this statement, and properly so. A few demonstrations by a highly experienced and proficient instructor pilot are very impressive. He recognizes immediately that his chances to walk away from a forced landing in poor terrain are much better than those of his fixed wing colleague, *provided the aircraft maintains its autorotative capability*. And here is the catch—design, manufacturing and maintenance deficiencies, for obvious reasons, are more critical in helicopters than fixed wing aircraft. As long as we don't build the perfect helicopter, maintained by infallible maintenance personnel, we have to face the proven fact that catastrophic failure, resulting in complete loss of aircraft control, occurs more frequently in helicopters than in airplanes.

Let's look into the possible realms of flight where a parachute would be a most desirable addition to our flight gear:

- Catastrophic inflight control or structural failure.
- Midair collision.
- Uncontrollable fire at altitude.
- Electrical failure, instrument failure, icing conditions, fuel starvation, or lack of adequate facilities to complete an instrument approach during instrument flight conditions.

These are hard cold facts. Under emergencies such as these, crews have no choice of emergency techniques to follow. They have no flexibility. The decision is made for them—complete destruction. In units where these catastrophic emergencies have occurred, there is definitely a morale factor to be considered.

During a recent 42-month period (1 January 1967 to 30 August 1970), 22 helicopters broke up in flight, resulting in 83 fatalities. There were 24 midair collisions involving 44 Army helicopters which resulted in 166 fatalities. Four inflight fires resulted in 21 fatalities. All of these accidents occurred at 500 feet agl or above, at altitudes where parachutes could have been used. Because

of the lack of any escape means, the occupants had no choice but to ride it out.

Making the conservative assumption that one-third of the 270 occupants involved in these accidents could have been saved with parachutes, and using DA Circular 385-23 (Costs of Fatal Injuries) as a guide, we come to the conclusion that the dollar value of those lost lives equals the purchase cost of at least 22,000 parachutes. (A parachute costs approximately $199, depending on type.) It is impossible to even approximate potential savings during the time helicopters have been in the Army inventory.

Probably the only valid arguments against the use of parachutes in helicopters are their incompatibility with seats and, in the case of some troop-carrying helicopters, the feasibility of putting parachutes on the passengers.

Parachutes are very unpopular with helicopter pilots. They report discomfort during flight, while wearing the present issue. This discomfort was attributed to size (primarily thickness) and weight, and restricted movement. The present issue parachutes are not compatible with all Army helicopters and will not be with future helicopters, unless significant changes are made in cockpit geometry, seat configuration and parachute design to merge with protective armor and survival kits. Another area of consideration concerns the amount of equipment a pilot is expected to take with him to the flight line—protective helmet, survival kit, weapon, protective armor, flight publications, etc. The prospect of adding a parachute becomes prohibitive. If it were possible to leave the parachute with the seat, this would no doubt be more readily acceptable.

Let's discuss another of the issues involved with parachutes in helicopters—the feasibility of putting parachutes on passengers. This is one of the real stumbling blocks. Naturally, the tactical feasibility of this is not sound. Some things to consider are the amount of equipment a trooper carries on his ride into combat, the time to load and off-load when the time element is critical and the number of troops carried on each helicopter, which would definitely create an egress problem. The prime consideration, of course, would be sufficient exits, coupled with the time element, during a catastrophic occurrence. To expect a passenger to use a parachute without proper training and psychological preparation would be unrealistic. It is accepted without further discussion that it would be totally unacceptable for crews to wear parachutes without furnishing the same protection to passengers. A cartoon in a leading magazine portrayed the crew of a commercial airliner walking casually back to the exit, all in parachutes and all trying to look unconcerned. There were looks of great concern on the passengers' faces.

To cover all aspects, we must consider weight penalties for parachutes in helicopters. For a crew of four, this would mean an additional 100 pounds. Do we operate our helicopters so close to their maximum lift capability that an extra 100 pounds could spell disaster? If the answer is yes, our operational policies should be questioned. Body armor was unanimously accepted without opposition and without haggling over the weight factor. Parachutes and body armor serve the same purpose—to save lives.

In our evaluation of the feasibility of bailouts from disabled helicopters in past accidents, we must consider the pilots' instinctive desire to get close to the ground when a serious problem develops. In those instances, our question should not be: "What was the altitude of the helicopter when it (finally) became uncontrollable?" Our question should be: "What was the altitude when the problem first developed?"

One of the most common arguments against the use of parachutes in helicopters is based on a distorted notion about the minimum height required to make a safe parachute descent. What is fact and what is fiction about these altitudes? The B-12 (back pack) and the NB6 (thin back pack) parachutes require a minimum altitude of 800 feet for guaranteed safe landings. However, we are dealing with life or death situations in which broken ankles are a cheap price to pay, when the only alternative is destruction. We feel that a pilot who has a chance to step out of his disabled helicopter at 500 feet with a parachute has an easy choice. The minimum altitude would be less with ballistically deployed parachute canopies.

The argument that you're going to be hit by the main rotor carries little weight, since most of our catastrophic inflight helicopter mishaps start with or result in main rotor separations. The fear of incapacitation by violent gyrations is probably exaggerated. There are good reasons to believe that structural failure will occur before the vibrations reach the disabling level, assuming the occupants are properly restrained and wearing helmets. When an inflight fire threatens the safety of the helicopter, a parachute-equipped crew would not have to gamble their lives trying to reach the ground in time. As long as structural

integrity is not critically affected, the helicopter offers a stable platform for bailout.

At the request of the Quartermaster General in May 1962, a study was conducted to determine the feasibility of the use of parachutes in helicopters. The study concluded that the use of parachutes for emergency bailout was feasible under autorotational conditions. It found parachutes even more feasible during catastrophic accidents where they provide the only possible means of survival. It was also concluded that helicopters should be equipped with parachutes for all flights above 500 feet.

Let's discuss the state-of-the-art development for emergency rescue of occupants by comparing a fixed wing and a rotary wing aircraft. We'll use the OV-1 and the AH-1G, since the concepts of operation for both were similar in many ways at their beginning. The OV-1 is a twin-engine fixed wing airplane, with an ejection seat and single engine capability. The AH-1G is a single-engine attack helicopter, with autorotation capability. There really is no comparison at all. The way it stacks up, the autorotation capability of the AH-1G certainly can't offset the extra engine and ejection seat of the OV-1.

The vast number of helicopters involved in Army aviation, second to none, should be reason enough for leadership in developing the state-of-the-art for emergency rescue parachutes or systems for all types of helicopters in the inventory. With our more sophisticated helicopters, instrument flights have become a common thing and with our combat experience, it has become common sense to fly higher, out of the reach of small arms fire. Many missions have involved over-the-top flying. Therefore, from the inception of helicopter use and deployment, the tendency has been to raise the operating altitude of helicopters. So the old theory of putting the helicopter on the ground as soon as possible to avoid a situation of possible catastrophic consequence doesn't hold true any more, due to the altitude and time element involved, although this method possibly saved many lives in the past. A future war might require nap-of-the-earth flying, if the problems associated with this type operation can be solved (navigation, spotting enemy targets, maneuverability, etc.). The desirability of having an alternative over and above that of autorotation for helicopters is recognized, but a policy of *look-the-other-way* on the use of parachutes in helicopters has persisted throughout their operational use.

Finally, a word of warning for those pilots who can only see the nuisance value of parachutes. When a parachute is needed in an emergency, it will practically always be with extreme urgency. The habit of not strapping it on, or stowing it neatly away all buckled up, does not fulfill this requirement. There are some tragic examples to illustrate the results of wrong attitude.

We have attempted to shed some light on this controversial subject by presenting some of the not-so-pleasant, as well as often-overlooked facts surrounding the issue. Are parachutes in helicopters a neglected commodity? Should parachutes be worn on all non-troop-carrying missions, such as test, training, administrative and instrument flights? The present AR 95-1 states that occupants of Army aircraft will be provided parachutes, except in helicopters, unless prescribed by the unit or installation commander. Does this place the formidable problems such as seat/parachute compatibility, egress problems, repack and maintenance of parachutes with a commander who has the least means at his disposal to solve these problems?

The autorotation capability of helicopters is insufficient to provide safe return to earth for the passengers and crews in every emergency situation. A number of lives are lost each year because there is no alternate means of escape for occupants of helicopters which, for a variety of reasons, cannot autorotate to safe landings. The use of parachutes is feasible for certain rotary wing aircraft under certain conditions. Parachutes are used in helicopters at a few test activities. It affords the minimum protection that a personal parachute is capable of. A compatible parachute or escape system for each type of helicopter should be developed and made available for operational helicopter crews. If it were truly compatible, it would be accepted.

The direction in which to channel the major effort, as it pertains to parachutes in helicopters, could be descent velocity retarding devices, such as the module escape, ejection or extraction systems. In the case of the module system it would extend the same protection to passengers as it does for crews. The logical system for gunships would be a method of ballistically severing the rotor blades, followed by extraction or ejection of crews, thereby offering escape at ground level. This could be used at the low altitudes associated with mid or high intensity type wars. The interest of pilots and crews of operational units could very well influence and hasten the development of these systems.

SEXY? COOL? WILD?

Call it what you want; we call it stupid! This unauthorized modification can be lethal in a crash sequence.

It must not be tolerated by commanders at any level. The SPH-4 helmet was designed to prevent injuries, not cause them.

Let's knock off the childish bit and be professionals!

Vortex Wake Turbulence

Adapted from U.S. Air Force AEROSPACE SAFETY and FAA AVIATION NEWS

VORTEX CAN MOST simply be described as swirling motion. *Wake* is described as the track left by a moving body. *Turbulence* is irregular atmospheric motion. A pair of these swirling tracks in the atmosphere are vortices.

Every aircraft, while in flight, generates a pair of counterrotating vortices trailing from the wingtips. With a helicopter as the generating aircraft (GA), the vortices trail from below the rotor tips (figures 1 and 2).

For several years a suspected cause factor in many accidents was propwash and later on, jet wake, until this invisible hazard to aviation was discovered. The hazard was recognized as early as 1952, but little was done about it until recent years. With the development of larger and heavier aircraft, the hazards of vortices have become a major concern to aviation. Following are examples of accidents where vortices were suspected or proven to be a cause factor.

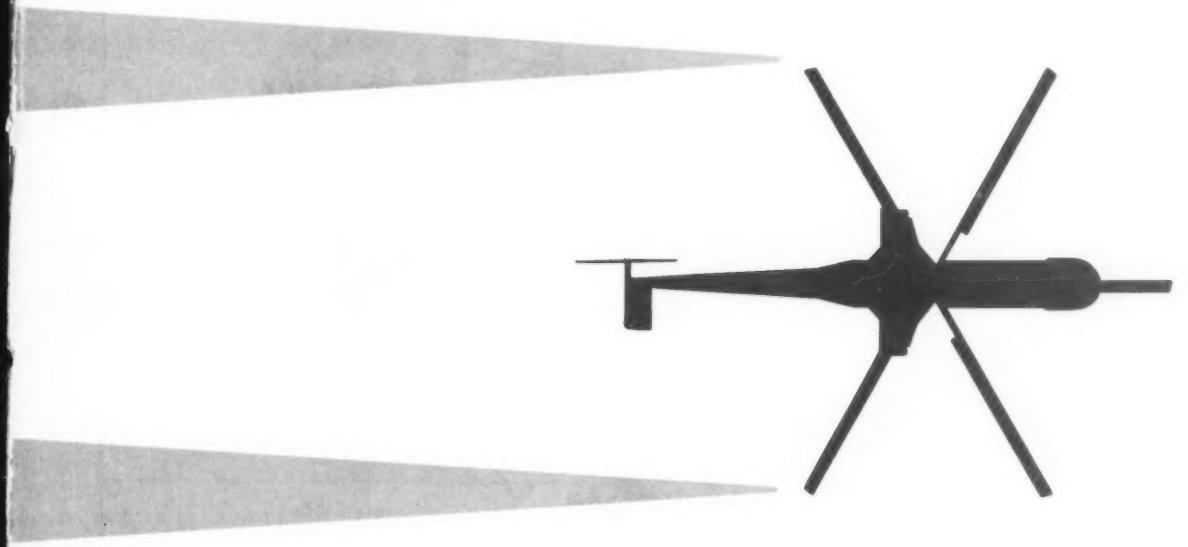
An OH-6 pilot landed and shut the engine down. While the main rotor was still coasting, a UH-1 hovered by. Suddenly the main rotor flexed down and severed the tail boom.

An OH-13H was on a southerly heading at 800 feet. Two F-104s were on an easterly heading at about the same altitude. The first one passed about 1,000 feet in front of the OH-13 and the second one passed to the rear. The OH-13 nosed up and pieces were seen coming off. It fell in an inverted attitude into a wooded area.

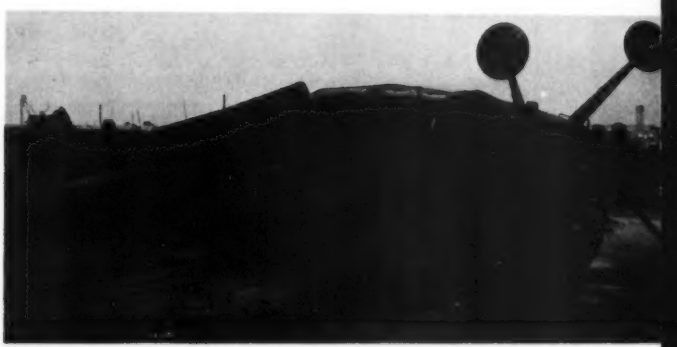
An O-1 pilot taxied to the approach end of the runway, made his engine runup and pretakeoff check and was waiting for takeoff clearance. A C-130 pilot was cleared to land, but made a go-around because his approach was too high. The O-1 pilot was cleared and started his takeoff. The aircraft broke ground just as the C-130 started a crosswind turn. The O-1's climb was normal until it reached an altitude of 100 feet and was two-thirds of the way down the 4,500-foot runway. Suddenly it rolled violently to the right, then to the left. It went into a steep dive and crashed in a nose low, left wing attitude.

An O-1 entered traffic following a CH-47. The CH-47 pilot made his approach over the active runway to a panel adjacent to the runway and terminated to a hover over the panel. Just as the O-1 was starting its roundout, the left wing went down. The pilot added full power and initiated a go-around. Suddenly the O-1 rolled violently to the right. The right wing struck the runway and the aircraft crashed inverted in a nose low attitude.

Richard K. Bell and Arnold R. Lambert
Education and Prevention Department
USABAAR



These accidents are just a few of many known mishaps that have occurred in recent years. During calendar years 1967, 1968 and 1969, the Army had 51 rotary wing and nine fixed wing wake turbulence accidents, with damages totaling $4,826,514. There were 17 fatalities and 37 injuries. During 1966, 1967 and 1968, general aviation had three rotary wing and 58 fixed wing wake turbulence accidents. Twenty-three people were killed and 91 injured. Twenty of the 61 aircraft involved were destroyed. Turbulence is the leading cause factor in air carrier accidents as well as general aviation accidents. This information was pre-



After hovering CH-47 crossed runway, O-1 rolled and crashed during roundout for landing

Remains of OH-13 which was inadvertently caught in vortices of passing jet aircraft at approximately 800 feet

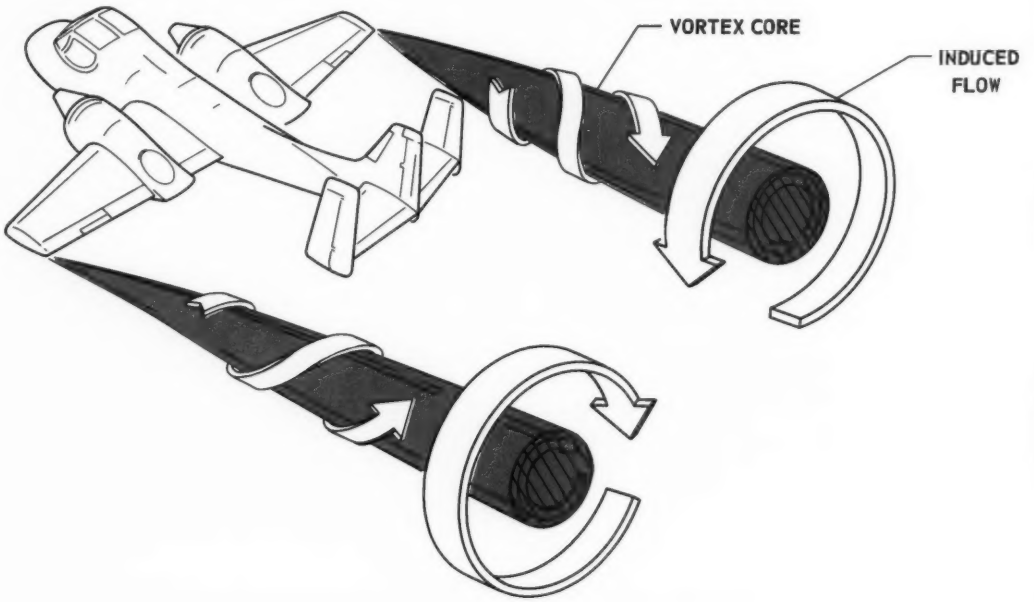


FIGURE 1
Illustration of Trailing Vortex Wake Behind a Conventional Aircraft

sented in March 1971 at an FAA turbulence symposium in Washington, D.C.

Many tests have been conducted in recent years in an effort to reach a possible solution to the problem. A great deal of knowledge was gained from the tests but many questions are still unanswered. In some of the tests, this invisible menace was made visible by installation of smoke generators on the GA. Following is some information pertaining to characteristics and behavior of vortices.

Characteristics—The vortex trailing from each wingtip or rotor tip is generated when lift is developed. The lowest pressure is near the center of the upper surface, which tends to draw the airflow over the top of the wing inward from the wingtip toward the fuselage. The highest pressure is near the center of the lower surface, which makes the airflow under the wing bend outward in an effort to equalize the pressure. The resulting circulation and the downward effect of the airflow over the wing causes the air leaving each trailing edge to form a vortex. The generation begins the moment the nosewheel lifts off the runway and ends when the nosewheel touches down. (For the sake of clarity, please note that although generation ends with touchdown of the nosewheel, the vortices already created could still be in the area.)

Vortices intensity depends on weight and speed of the GA. Weight is the basic factor contributing to vortices intensity. The greatest strength of vortices is generated on takeoff and landing when the GA is heavy and slow and a high angle of attack exists.

Behavior—Vortices behavior is sometimes affected by wind conditions and cannot always be accurately predicted. Here are some of the behavior patterns discovered during tests.

The vortex trailing behind the left wing rotates in a clockwise direction and the one from the right wing rotates counterclockwise. Tests with heavy aircraft have shown that the diameter of the vortex core ranges from 25 to 50 feet, but the field of influence is larger. The vortices remain close together, about three quarters of the wingspan of the GA, until dissipation. When generated by a heavy jet, they begin to descend at a rate of 400 to 500 feet per minute and tend to level off

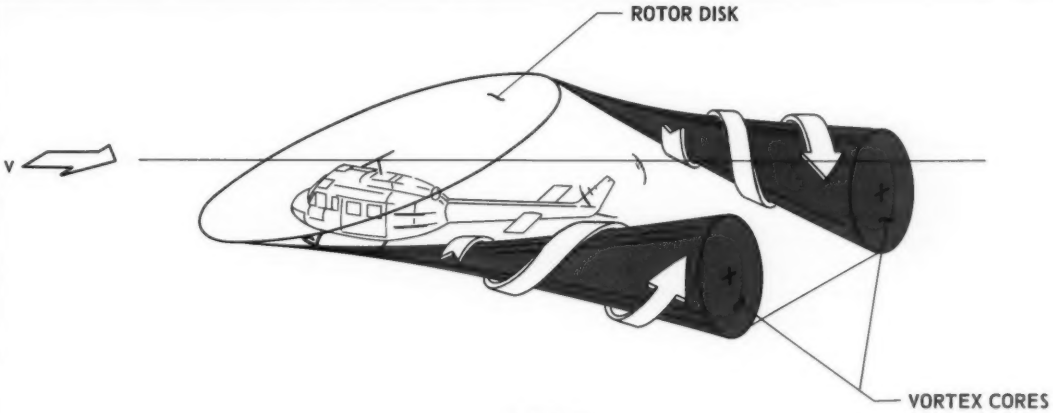


FIGURE 2
Illustration of The Helicopter Wake Showing How The Vortices Roll Up At The Tips and Expand Downstream

after a descent of 800 to 900 feet (figure 3). Time and distance behind the GA are the major factors for decreasing intensity and eventual breakup of the vortices. Natural atmospheric turbulence can shorten breakup time, but even then a choppy condition can remain in the area for some time.

Vortices generated low enough to reach ground level tend to separate and move laterally over the ground at about 5 knots (figure 4). A crosswind at ground level, depending on its speed, could cause upwind vortices to remain stationary on the runway. The wind could also increase the drift of downwind vortices to a paralleling runway. A tailwind could move the vortices forward into the touchdown zone of the GA.

Vortices encounters—The effect and seriousness of encounters with vortices depend on several things. The greater the distance from the GA, the lesser the effect on the encountering aircraft. The size of the encountering aircraft as compared to the GA is important. The smaller encountering aircraft will receive more violent effects. Low altitude encounters can be more serious because there will be less time to regain control of the aircraft. Direction is also a determining factor as to the seriousness of the encounter. Figure 5 shows three points of encounter and their effect on the penetrating aircraft. The severity, as stated before, would depend on distance from the GA and size in comparison. Crosstrack encounter (aircraft A) would create an updraft, downdraft and updraft effect, in that order. Along-track between vortices (aircraft B) would produce a downdraft effect. This is because the counterrotating vortices create a downdraft between them. Along-track through vortex center (aircraft C) is the most hazardous encounter because it could produce a violent roll beyond the structural limits of the aircraft. Figure 6 shows some additional points or directions of encounter and probable effect on the aircraft.

Vortices avoidance procedures—The FAA's Air Traffic Service is applying IFR separation standards designed to preclude vortices encounters, but in most VFR situations the pilot sets up his own separation from other aircraft. Since he alone controls his potential encounter with vortices, he should be able to visualize their behavior and probable location. The location of vortices at higher altitude is difficult to predict because visual contact with the GA is not always established. When the location and flight path is known, the pilot should fly at or above the altitude of the GA. Avoid the area behind and below the GA. Persistant vortices encounter can often be avoided by a

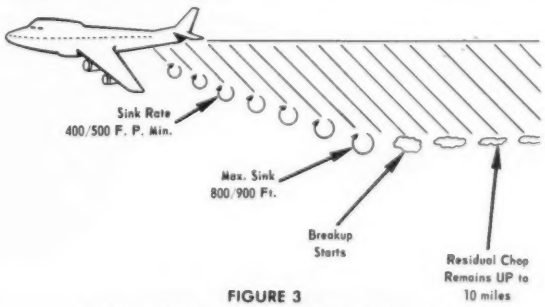


FIGURE 3
Deterioration of Wingtip Vortices of Heavy Jet

VORTEX WAKE TURBULENCE

slight lateral change in flight path. Vortices tend to level off at 800 to 900 feet below the GA. Therefore, when it is not possible to fly above him, stay 1,000 feet below him until lateral change in your flight path can be made.

The possibility and probability of vortices encounter increases at air terminals with heavy jet traffic. Under certain conditions the ATC will apply procedures for separating other aircraft from large turbojets. They will also provide VFR aircraft with which they are in communication and which, in the tower's opinion, may encounter vortices from a heavy jet, the position, altitude and direction of flight of the heavy jet. They will follow up with the phrase "Caution—wake turbulence." Thereafter, the VFR pilot is expected to adjust his operations and flight path as necessary to avoid vortices encounter.

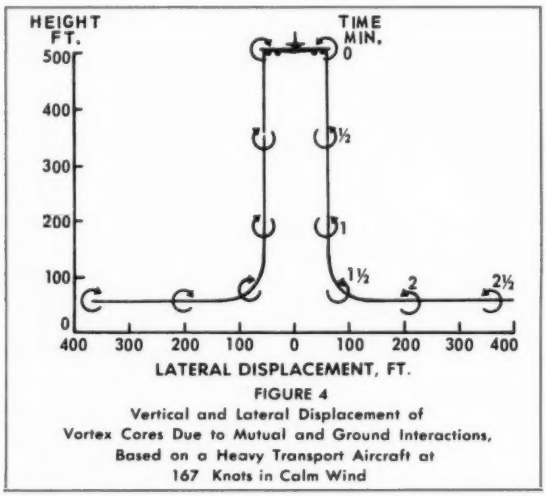


FIGURE 4

Vertical and Lateral Displacement of Vortex Cores Due to Mutual and Ground Interactions, Based on a Heavy Transport Aircraft at 167 Knots in Calm Wind

The following illustrated vortices avoidance procedures for takeoff and landing situations were published in the March 1971 issue of FAA AVIATION NEWS and are reprinted by permission.

1. Landing behind a heavy jet—same runway.

TOWER: "Number two to land, following Lockheed C5A on final. Caution wake turbulence."

PILOT: Stay at or above the heavy jet's final approach flight path—note his touchdown point—land beyond it.

2. Landing behind a heavy jet—when parallel runway is closer than 2,500 feet.

TOWER: "Cleared to land Runway 9-R. Caution wake turbulence—B747 on final 9-L."

PILOT: Note wind for possible vortex drift to your runway—request upwind runway if practical. Stay at or above the heavy jet's final approach flight path. Note his touchdown point—land beyond a point abeam his touchdown point.

3. Landing behind a heavy jet landing on a crossing runway.

TOWER: "Cleared to land Runway 9. Caution wake turbulence. Boeing 747 crossing threshold landing Runway 36."

PILOT: Cross above the heavy jet's flight path.

4. Landing behind a departing heavy jet on the same runway.

TOWER: "Cleared to land—caution wake

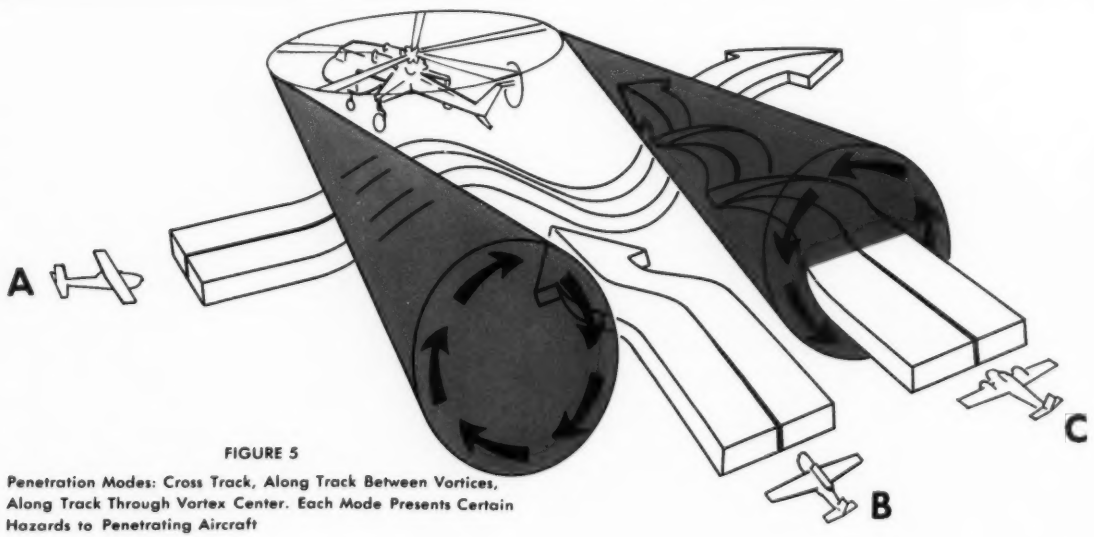


FIGURE 5

Penetration Modes: Cross Track, Along Track Between Vortices, Along Track Through Vortex Center. Each Mode Presents Certain Hazards to Penetrating Aircraft

turbulence—C-141 departing."

PILOT: Note heavy jet's rotation point—land well before rotation point.

5. Landing behind a heavy jet departing on a crossing runway.

TOWER: "Cleared to land Runway 15—caution wake turbulence—C-141 departing Runway 09."

Note: The tower will withhold clearance to land for a prescribed time period where an inflight crossing of paths is evident.

PILOT: Note heavy jet's rotation point—if past the intersection—continue the approach—land prior to the intersection. If heavy jet rotates prior to the intersection, avoid flight below the heavy jet's flight path. Abandon the approach unless a landing is assured well before reaching the intersection.

6. Departing behind a heavy jet.

TOWER: The tower will withhold clearance for a prescribed time period for takeoffs on the same runway, a parallel runway separated by less than 2,500 feet, and any other situation where an inflight crossing of courses is evident.

PILOT: Rotate prior to heavy jet's rotation point, continue climb above heavy jet's climb path until turning clear of his wake. Avoid subsequent headings which will cross below and behind a heavy jet. Be alert for any takeoff situation which could lead to a vortex encounter.

7. Intersection takeoffs, same runway.

TOWER: Towers will withhold intersection takeoff clearance for a prescribed time period behind a large turbojet aircraft on the same runway.

PILOT: Be alert to adjacent heavy jet operations particularly upwind of your runway. If intersection takeoff clearance is received, avoid subsequent heading which will cross below a heavy jet's path.

8. En route VFR—(altitude plus 500 feet).

TOWER: No clearance involved.

PILOT: Avoid flight below and behind a heavy jet's path. If a heavy jet is observed above you on same track (same or opposite direction) adjust your position laterally, preferably upwind.

9. Helicopters. A hovering helicopter generates a downwash from its main rotor(s) similar to the prop blast of a conventional aircraft. In forward flight, this energy is transformed into a pair of trailing vortices similar to wingtip vortices. Pilots of small airplanes and helicopters should avoid both the vortices and downwash of a heavy helicopter.

No pilot, due to his natural instincts for self-preservation, would deliberately fly into a tornadic funnel. Vortices are, in a sense, horizontal tornadoes. Scientists have already proven that vortices can be detected. A test was conducted using a laser system and a heavy aircraft flying low over a high smoke tower. The laser system detected and recorded the wake turbulence before it was sighted in the smoke. Research is continuing and perhaps some day a detection and warning system will be perfected. Until that time, the pilot, with help from the tower, must be aware of possible wake turbulence in his flight path and necessary precautions he should take to avoid the hazard.

A highly informative and eye-opening film entitled "Caution Wake Turbulence," TF 6568, is available through most Air Force audio-visual centers. It is recommended that all aviation safety officers check with their audio-visual center for information on how they may obtain this film for use in unit safety meetings.

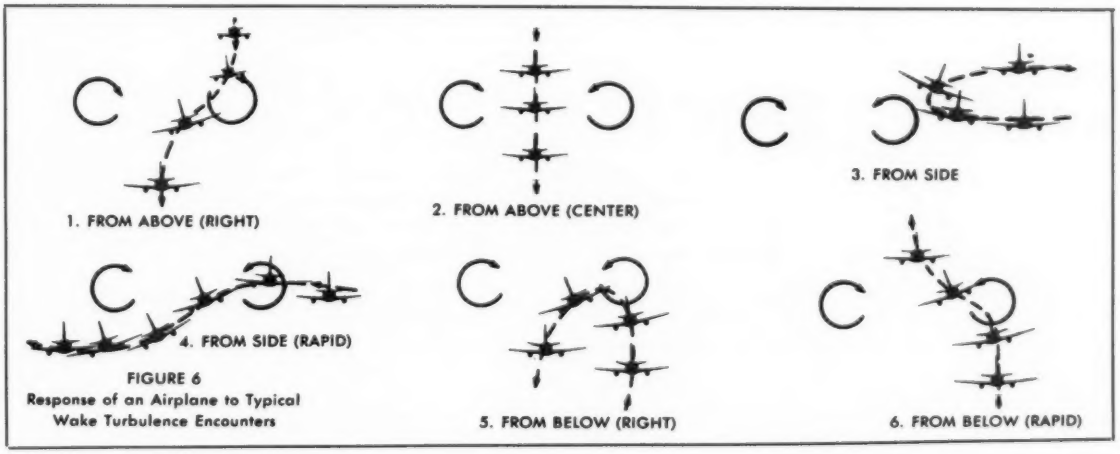


FIGURE 6
Response of an Airplane to Typical Wake Turbulence Encounters

USAASO Sez

The U. S. Army Aeronautical Services Office discusses

Authorization for sun glasses

Army-FAA agreement

Sun Glasses: *Air traffic controllers!* You are now authorized sun glasses. Authorization is contained in CTA 50-901, 17 February 1971. The CTA does contain one erroneous statement: "Enlisted personnel in MOS 71P with duty position as air traffic controller." Well, don't be alarmed. A message correcting the error is out. DA message 242154Z, May 71, paragraph 1a, amends the authorization: "Enlisted personnel with duty position as air traffic controller." For you ATC types who require prescription sun glasses, your authority is contained in AR 40-3, paragraph 118g. Now we should all see better. Better controlling!

Joint Use Airspace: "Joint checking accounts," "joint charge accounts" or "joint ownership" are terms we have all come to know. They have been the butt of many jokes and probably left unfavorable impressions with many. So, right away when someone starts talking about "joint use airspace" most of us would automatically think of a piece of airspace which we share with someone else who can use it any time he pleases. And, if that piece of airspace is a restricted area assigned to the Army, we sure don't want to share it! Right? Wrong! Let me explain. Joint use restricted areas in CONUS are restricted areas for which "using agencies" and "controlling agencies" have been designated in accordance with a "Letter of Procedure." The "using agency" in our situation is the Army and the "controlling agency" is the Federal Aviation Administration (FAA). Designation of the FAA as the controlling agency in Army restricted areas is for air traffic control purposes *only* and applies *only* during the period when the area is released to FAA. Such designation does not negate, compromise or modify Army control or use of the area. So, even though an Army restricted area may be designated as joint use airspace, we don't lose control of it. Our partner, the FAA, must first get *permission* to use it and must return it to Army use as our needs dictate.

Future plans for use of the joint use airspace by the FAA include routing IFR traffic through it on the new area navigation (RNAV) routes. USAASO foresaw the possible problems this could present and requested the FAA to confirm their intent (What's yoah intent, Suh?). An immediate response from the FAA Chief of Airspace and Air Traffic Rules Division stated, in part: "To make optimum use of the area navigation capability, we have planned some area navigation routes which traverse joint use restricted areas. However, their use will be limited to those times when the using agency has released the airspace to the controlling agency."

This RNAV routing will not come as a surprise to those astute airmen who have been keeping current with the DOD FLIP. The 27 May 1971 issue of Planning, Section, II, gave a good rundown on area navigation in Pilot Procedures III Enroute, Airway Systems.

PFC Carolyn Carlson, who is studying to be an approach controller in the Department of General Subjects, USAAVNS, Ft. Rucker, Ala., reads the plaque that goes with the Daedalian Award. The silver trophy is on display in the U. S. Army Aviation Museum

Army Given Daedalian Award

THE DAEDALIAN Weapons System Award for the year 1970 has been given to the U. S. Army Aviation Center at Ft. Rucker, Ala., for the development of the armed helicopter.

With the silver trophy is a plaque explaining that the center was given the award because it represents the Army aviation community in the broadest sense.

The award is given by the Order of Daedalians. The Order was formed in 1934 and is dedicated to ensuring that America will always be preeminent in air and space, to encouraging flight safety, to fostering an esprit de corps in the military air forces, to promoting the adoption of the military as a career, and to aiding deserving young men in specialized higher education through the establishment of scholarships.

Development of the armed helicopter at Ft. Rucker was started in June 1956 when the Combat Developments Office (now the U. S. Army Combat Developments Command Aviation Agency) undertook the project of fabricating an armament system for the OH-13 helicopter. From that beginning has evolved the advanced aerial fire support system now being used.

The plaque says "The Daedalian Weapons System Award is presented to the Army Aviation Center, Ft. Rucker, Ala., for the development of the Army armed helicopter. The center represents the Army aviation community in its broadest sense. Literally, those thousands of dedicated individuals who fielded a weapons system in Vietnam which richly deserves the accolades it receives. The Army Aviation Center brought together the work of these many devoted pioneers, culminating in the Army armed helicopter and with it the advanced aerial fire support system."